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The Milk Marketing Board Twin Calf Trial: An Interim Report

BY

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SUMMARY.—Interim results in the M.M.B. Twin-Calf Trial are presented. Data are considered for 486 cattle which have been given a single injection of a freeze-dried preparation of P.M.S. in the follicular phase of the oestrous cycle. Response at 5 dosage levels of P.M.S. has been observed. Ovulation without oestrus was found to occur in 14.4 per cent. of animals. In those in oestrus after injection, the percentage of cattle producing additional eggs increased from 33 per cent. at 800 I.U. to 56 per cent. at 2,000 I.U. The mean ovulation rate rose from 1.43 at 800 I.U. to 3.94 at 2,000 I.U. Seventy-eight per cent. of animals became pregnant after first insemination. In cattle which so conceived, 20.5 per cent. possessed multiples at 800 I.U. and 39 per cent. possessed multiples at 2,000 I.U., when checked in the sixth or seventh week of pregnancy. Heavy loss in eggs occurred in the early weeks of pregnancy; total litter loss was observed in cows carrying multiples after the time of pregnancy diagnosis. Calvings in 127 cattle, injected with doses of 800 to 1,000 I.U. have been noted; 29 of these (22.8 per cent.) have been multiples.

THE number of eggs produced at mating in the farm animal is mainly controlled by gonadotrophic hormones elaborated in the anterior pituitary. More than a quarter of a century has passed since workers found a cheap source of one important gonadotrophin (FSH) to be the blood serum of the pregnant mare. The discovery set in motion studies in the use of the material (serum gonadotrophin—P.M.S.) in the control of animal fertility. Early efforts were directed at the problem of seasonal breeding in sheep, and it was not until the last war that attention was turned to possible applications in cattle.

Hammond and Bhattacharya (1942) showed that it was possible to induce superovulation by P.M.S. injection. In most cases, hormone injection was combined with expression of the corpus luteum, a procedure which failed to give rise to double ovulation consistently. Later work, where P.M.S. was injected in the follicular phase of the oestrous cycle, appeared more promising (Hammond, 1949) but numbers involved were few. Studies in the use of P.M.S. have been reported by Folley and Malpress (1944), Dowling (1949), Rowson (1951) and Brock and Rowson (1952) but the emphasis has been mainly on the induction of superovulation to supply eggs for transplantation work. In this, the degree of superovulation attempted went beyond that apparently necessary or desirable in a treatment aimed primarily at increasing the twinning percentage. Little guidance upon appropriate doses of P.M.S. to employ in twinning work was provided by these studies, since different preparations of P.M.S. were employed; the use of these forms (purified, freeze-dried and raw serum) gave different results in cattle (Rowson, 1951) and sheep (Gordon, 1958).

Towards the end of 1958 the Milk Marketing Board announced that they were to introduce a 2-year field trial to test the use of P.M.S. as a means of increasing the percentage of twin births. The period of injections closed at the end of December, 1960, and some statements about the practicability of the P.M.S. technique can now be made.

The method of treatment which the M.M.B. sought to test consists of a single, subcutaneous injection of a freeze-dried preparation of P.M.S. given in the late stages of the cow's breeding cycle, *i.e.*, at a time when development of the egg, due for release at the next oestrus, is getting under way. This approach was similar to that already tested with encouraging results in sheep.

Area of Work

The trial has been conducted from Caersws, Montgomeryshire, a village lying in the traditional rearing area of Mid-Wales. In 1958, some 30,000 Hereford bull inseminations were carried out from Welshpool and its sub-centres, and it was known that many were in the herds of farmers primarily concerned in rearing. Ground covered in the work

included the counties of Montgomery and Radnor, and parts of Merioneth, Hereford, Brecon and Shropshire. In choosing this area for testing the technique, it was borne in mind that many farmers engaged in rearing were using cross-bred cows capable of producing sufficient milk to sustain twin calves. Custom on many farms is to buy in a second, beef-cross, calf to put on the cow at calving. What was hoped, in the trial, was a possible saving in the need for the farmer to buy that second calf. It seemed possible that there would be sufficient economic incentive in this to get the active co-operation of farmers.

Aims and Objects

There were 2 main considerations in the field work: (1) the application of the hormone technique in such a way as to induce a reasonable proportion of cattle to carry twin-calves and (2); the practical outcome of twin-pregnancy when animals were afforded additional feeding in anticipation of twins.

Work in sheep where a similar hormone approach was attempted, suggested that it might be possible to induce superovulation in about 50 per cent. of cattle. Allowing for the fact that some cows would fail to carry more than a single calf, regardless of the number of eggs produced, and that others would fail to conceive at the mating immediately following injection, it seemed possible that 33 per cent. of cattle might be encouraged to give birth to multiples.

The Collection of Data

In treatments carried out, most cows have been injected 16 or 17 days after oestrus, this heat being reported by the farmer to his local A.I. office. At injection, notes were made about each animal and an attempt made to locate the current corpus luteum. Seven to fourteen days after routine insemination, ovaries were palpated *per rectum* to determine number of ovulations. Cows possessing more than one corpus luteum, which conceived at first insemination, were again examined when they reached some 6 weeks in pregnancy, to determine the number of foetuses.

A record of examinations and observations has been maintained for each animal, so that those which failed to remain pregnant or were lost to the trial can be accounted for. Where practicable, sets of multiples were weighed soon after birth and information gathered about the cow's condition and incidents which arose at calving. Finally, note has been taken of the return to regular breeding following multiple-pregnancy.

Entry of Cattle

At the end of December, the injection of cattle was brought to a close. Five hundred and twenty-five animals had been put forward, during 2 years, by 317 farmers who use A.I. from Welshpool Centre and its sub-centres. Most farmers entered only 1 cow from the herd; a few tried as many as 10. Nearly all the entries have been commercial, non-pedigree cattle maintained in accord with local custom. There is no reason to believe that animals are unrepresentative of the cow population put to A.I. in the Mid-Wales area.

Of 525 cattle entered, 415 provide present data on factors affecting ovulation response; 70 cattle, which showed "silent heat" after injection, provide additional but partial information. In 38 cattle, it proved impossible to obtain information about response; 2 cattle remain to be examined for ovulations.

In discussing results, first consideration is ovulation response in relation to treatment and animal circumstance; secondly, the problem of "silent heat"; thirdly, conception; fourthly, egg and foetal loss; and finally, calvings.

Number of Ovulations

In encouraging cattle to give birth to twins, 2 approaches have been examined;

(1) Using a low dosage level of P.M.S. in an attempt to keep the number of ovulations within narrow limits—*i.e.*, inducing cows to produce 2 eggs only.

(2) Using higher doses of P.M.S. to induce superovulation, regardless of egg number, and determining how far egg and foetal loss in pregnancy go in reducing the number of calves carried to term.

This second approach gave scope for study of possible ways of controlling litter size to 2 in cattle possessing more than that number in early pregnancy.

Ovulation data are available for 415 cows which were injected, came in oestrus and were inseminated, then examined for evidence of ovulations at the following mid-cycle stage. Five dosage levels of P.M.S. have been used—800 I.U. to 2,000 I.U.

There is little to suggest that the ovulation process is disturbed by any of the doses employed. Follicles which matured to ovulation size but apparently failed to ovulate, were occasionally noted in cattle injected with doses of 2,000 I.U., but rarely found in animals receiving lower doses. Even where unovulated follicles were noted, there is little to suggest that they gave rise to defects in fertilisation and conception.

There is evidence of a dose-response relationship over the range of doses employed. A measure of control over the extent of superovulation lies in the amount of P.M.S. injected. This is shown in Table I.

Doses of 800 I.U. do not lead to great variability in response, but as dose increases animals may give

TABLE I
AVERAGE NUMBER OF OVULATIONS IN RELATION TO DOSE

(i.u.) P.M.S. dosage	Number of cattle examined	Number cattle that ovulated	Range of ovulations	Mean number of ovulations
800	100	99	1—5	1·43
1 000	145	142	1—15	1·77
1,200	42	42	1—17	2·45
1.600	14	14	1—15	2·71
2,000	114	113	1—25	3·94
All doses	415	410	1—25	2·39

TABLE II
OVULATIONS IN RELATION TO DOSE OF P.M.S.

Dose i.u.	Ovulations								
	0	1	2	3	4	5	6	6+	All
800 examined	1	66	27	3	2	1	—	—	100
As per cent.	1·0	66·0	27·0	3·0	2·0	1·0	—	—	100·0
1,000 examined	3	89	31	10	6	2	2	2	145
As per cent.	2·1	61·4	21·4	6·9	4·2	1·4	1·4	1·4	100·0
1,200 examined	—	28	3	5	2	—	1	3	42
As per cent.	—	66·7	7·1	11·9	4·8	—	2·4	7·1	100·0
1,600 examined	—	7	3	2	1	—	—	1	14
As per cent.	—	50·0	21·4	14·3	7·1	—	—	7·1	100·0
2,000 examined	1	49	14	13	6	5	8	18	114
As per cent.	0·88	43·0	12·3	11·4	5·3	4·4	7·0	15·8	100·0
All examined doses	5	239	78	33	17	8	11	24	415
As per cent.	1·2	57·6	18·8	8·0	4·1	1·9	2·7	5·8	100·0

rise to as many as 25 eggs. This is made clear in Table II. With 800 I.U., most cows that respond do so by producing 2 eggs only. A dose of 1,000 I.U. leads to no increase in twin-ovulating animals, but the proportion that produce 3 and more eggs is substantially greater. Even so, the proportion of cows that produce more than 6 eggs is not high (1.4 per cent.).

Where doses of 1,200 and 1,600 I.U. are employed, the proportion of animals producing more than 3 eggs rises further, as does the proportion producing more than 6. The highest dosage level of P.M.S. (2,000 I.U.) brings a substantial increase in cows producing more than 6 eggs. The percentage of cattle responding rises from 33 per cent. at the 800 I.U. dosage level to 56 per cent. at 2,000 I.U.; the overall percentage responding is 41.2 per cent.

The figures in Table II show that, in animals responding to the injection, there is a tendency for the proportion producing 2 eggs to fall as the dosage level of P.M.S. increases. With the higher doses, P.M.S. probably often encourages those cows which would respond mildly to do so by producing more eggs than necessary. However, the employment of 2,000 I.U. does induce more cattle to respond than 800 to 1,000 I.U., and it is evident that in some more P.M.S. is required to induce any form of response than in others. There may, however, be some proportion of cattle which will not respond to P.M.S., regardless of dosage level employed.

Time of Injection

Cattle have been injected with P.M.S. at different stages of the oestrous cycle. While most have been treated 16 or 17 days after a previous heat, some have been injected as early as day 15, others as late as day 19. Details of response, according to the dose of hormone employed, are given in Table III. Of 11 cows injected 15 days after oestrus, only one responded.

Cattle injected on days 18 and 19 are few in number, and although response was induced, there is some reason to believe that administration at this late stage of the cycle may aggravate the condition of "silent heat" (discussed later in the text). When total results are considered, injection on days 16 and 17 of the cycle give similar results.

Only 3 animals, of the 525 injected, have been observed to come in oestrus prior to the time for administering P.M.S., *i.e.* on or before day 17 of the cycle. The reporting of pre-injection heats has been satisfactorily dealt with by farmers participating in the work. There has been little problem, in applying this form of therapy, from spurious pre-injection heats. Injected animals have come in oestrus 18 to 30 days after the previous heat, and a majority came in oestrus at intervals of 20 to 22 days. This is shown in Table IV.

It does not appear that P.M.S. affects the average length of the oestrous cycle, and in this the cow differs from the ewe, where there is a tendency for the cycle to be shortened. The average figure for all cows (21.23 days) does not differ appreciably from the accepted figure of 21 days.

In those cows which have shorter than normal cycles, and come in oestrus within 2 days of injection, the percentage responding is very low. Where low doses (800 to 1,200 I.U.) have been employed, the possibility of additional eggs is particularly slender. Because of variability in normal oestrous cycle length, and an apparent need for a 2-day period of stimulation to induce superovulation, the present technique can be successful only to a limited degree.

There is little to suggest that treatment with any of the chosen dosage levels of P.M.S. has given rise to abnormal symptoms at time of oestrus. Cows producing many eggs have shown no more intense symptoms than those having single ovulations.

Season

In the course of the injection period, cattle have been observed during every month of the year for

TABLE III
RESPONSE IN RELATION TO TIME OF P.M.S. INJECTION

		Stage of cycle when P.M.S. was given					
		15	16	17	18	19	All stages
800 i.u.	Examined	4	4	89	3	—	100
	Responded	0	3	29	1	—	33
	Per cent. response ...	Nil	75·0	36·8	33·3	—	33·0
1,000 i.u.	Examined	5	45	93	1	1	145
	Responded	0	17	34	1	1	53
	Per cent. reponse ...	Nil	37·8	36·6	100·0	100·0	36·6
1,200 i.u.	Examined	1	31	9	1	—	42
	Responded	0	8	6	0	—	14
	Per cent. response ...	Nil	36·7	66·7	Nil	—	33·3
1,600 i.u.	Examined	—	7	7	—	—	14
	Responded	—	2	5	—	—	7
	Per cent. response ...	—	28·6	71·4	—	—	50·0
2,000 i.u.	Examined	1	63	44	5	1	114
	Responded	1	35	26	2	0	64
	Per cent. response ...	100·0	55·6	59·1	40·0	Nil	56·1
All doses	Examined	11	150	242	10	2	415
	Responded	1	65	100	4	1	171
	Per cent response ...	9·1	43·3	41·3	40·0	50·0	41·2

TABLE IV
DISTRIBUTION OF OESTROUS CYCLE LENGTHS IN RELATION TO DOSE OF P.M.S.

		Cycle duration (in days)													All cycles
		18	19	20	21	22	23	24	25	26	27	28	29	30	
800	Examined	3	4	31	32	16	6	4	2	—	—	2	—	—	100
	Per cent.	3·0	4·0	31·0	32·0	16·0	6·0	4·0	2·0	—	—	2·0	—	—	100·0
1,000	Examined	3	16	31	49	29	9	3	3	—	—	—	—	2	145
	Per cent.	2·1	11·0	21·4	33·8	20·0	6·2	2·1	2·1	—	—	—	—	1·4	100·0
1,200	Examined	—	4	11	12	9	3	1	1	1	—	—	—	—	42
	Per cent.	—	9·5	26·2	28·6	21·4	7·1	2·4	2·4	2·4	—	—	—	—	100·0
1,600	Examined	—	—	4	4	2	2	1	1	—	—	—	—	—	14
	Per cent.	—	—	28·6	28·6	14·3	14·3	7·2	7·2	—	—	—	—	—	100·0
2,000	Examined	1	13	25	28	22	14	5	2	—	—	1	2	1	114
	Per cent.	0·9	11·4	21·9	24·6	19·3	12·3	4·4	1·8	—	—	0·9	1·8	0·9	100·0
All Doses	Examined	7	37	102	125	78	34	14	9	1	—	3	2	3	415
	Per cent.	1·7	8·9	24·6	30·1	18·8	8·2	3·4	2·2	0·2	—	0·6	0·4	0·6	100·0

the 800 I.U. and 1,000 I.U. dosage levels. Data are in Table V, for months of the year and according to the dose of P.M.S. employed. There is no month in which a response was not induced. In the early months of the year (January to March) response to doses of 800 to 1,000 I.U. was generally greater than that observed in the following months. There may be a suggestion, in this pattern of response, that the willingness of the cow to shed additional eggs is affected by changes in the light environment.

When response to the highest dosage level of P.M.S. is considered, it is clear that treatment can overcome possible seasonal effect; cattle shed additional eggs as readily in June as in other months. All data considered, it would appear that treatment may be applied with little reference to time of year.

Type of Cow

Injections have covered a variety of cattle, used by the farmer in different ways. While most animals have been rearing 1 or 2 calves, some have been "dry" and others have been milking cows. There is a suggestion that "dry" cows respond more readily than lactating animals. Cattle that are milked respond in a percentage similar to that observed for animals rearing 1 or 2 calves. Poorest response has been noted in cows used in suckling of 3 to 4 calves. Results suggest that lactation does affect the ability of the cow to respond to P.M.S. therapy.

The age of injected cattle has varied from 2 years to more than 10 years, but there is little difference in the percentage producing additional eggs when this factor is considered. Cattle, at the time of injec-

TABLE V
RESPONSE ACCORDING TO MONTH OF INJECTION
(Data For Years 1959 and 1960 Combined)

Dose i.u.		Months												
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	All Months
800	Cattle examined ...	2	1	7	7	26	26	11	6	3	3	2	6	100
	Responded	1	1	2	2	12	7	2	3	1	0	1	1	33
	Per cent. response ...	50·0	100·0	28·6	28·6	46·2	26·9	18·2	50·0	33·3	Nil	50·0	16·7	33·0
1,000	Cattle examined ...	20	9	7	14	15	14	21	14	3	5	9	14	145
	Responded	11	5	2	6	3	3	8	4	1	2	3	5	53
	Per cent. response ...	55·5	55·5	28·6	42·9	20·0	21·6	38·1	28·6	33·3	40·0	33·3	36·0	36·6
1,200	Cattle examined ...	—	2	7	8	14	1	—	—	10	—	—	—	42
	Responded	—	2	3	1	5	0	—	—	3	—	—	—	14
	Per cent. response ...	—	100·0	42·9	12·5	36·0	Nil	—	—	30·0	—	—	—	33·3
1,600	Cattle examined ...	—	—	—	—	5	1	—	2	—	5	1	—	14
	Responded	—	—	—	—	2	1	—	1	—	2	1	—	7
	Per cent. response ...	—	—	—	—	40·0	100·0	—	50·0	—	40·0	100·0	—	50·0
2,000	Cattle examined ...	1	—	—	—	—	14	19	17	5	22	26	10	114
	Responded	1	—	—	—	—	8	9	8	1	17	14	6	64
	Per cent. response ...	100·0	—	—	—	—	57·2	47·4	47·1	20·0	77·3	53·8	60·0	56·1
All Doses	Cattle examined ...	23	12	21	29	60	56	51	39	21	35	38	30	415
	Responded	13	8	7	9	22	19	19	16	6	21	19	12	171
	Per cent. response ...	56·5	75·0	33·3	31·0	36·7	33·9	37·3	41·0	30·0	60·0	50·0	40·0	41·2

tion, have been graded by eye for general fitness and body conditions, but analysis of the ovulation data, with such factor in mind, reveals little.

Records on the size and apparent state of activity of the ovaries, taken at the time of hormone injection, indicate that superovulation occurs less frequently in cattle whose ovaries are below average size than in those where both are normal. Cattle which have given birth to a set of natural twins prior to hormone injection have responded no more readily than those with a history of single calvings.

While most animals entered for injection have been Hereford, Shorthorn or Hereford-Friesian crosses, there has been opportunity to observe pure-bred Hereford, Welsh Black, Shorthorn and Friesian cattle. Hereford and Friesian cows have shown a similar response; response has been poorest in Shorthorn and highest in Welsh Black cattle. The few Ayrshire and Red Poll cattle responded at the level general for most animals. Cross-bred cattle produced additional eggs as readily as did pure-breds.

Cattle have been injected at intervals following calving. In some cases, animals had shown regular breeding cycles for some time prior to injection; in others the pre-injection oestrus was the first observed after parturition. Analysis of data does not suggest that the *post-partum* interval is important in determining response to P.M.S.

Studies in the reproductive physiology of the cow have already drawn attention to the fact that the right ovary tends to be more active than the left; this observation is borne out in present results. In cattle which respond to P.M.S. by producing 2 eggs, and where ovulations are confined to 1 ovary, the right is the one usually involved. This is shown in Table VI. In cows producing more than 2 eggs it is often observed that the ovary possessing the more corpora lutea is the right. It is possible that the greater activity of the right ovary and consequent tendency for uneven distribution of eggs within the 2 horns

TABLE VI
SITE OF OVULATIONS IN THE OVARIES

SINGLE-OVULATING CATTLE.

	—Location of Ovulations—	
	Left ovary	Right ovary
No. cattle examined.	98	141
As per cent of all.	41·0	59·0

TWIN-OVULATING CATTLE.

	Both in left ovary	One ovulation in each ovary	Both in right ovary
No. cattle examined,	8	47	23
As per cent of all.	10·3	60·3	29·4

CATTLE SHEDDING THREE AND MORE EGGS

	Most in left ovary	Equal No. in each ovary	Most in right ovary
No. cattle examined.	21	13	59
As per cent. of all.	22·6	13·9	63·5

of the uterus may have some bearing on the successful establishment of multiple-pregnancy.

"Silent Heat"

The P.M.S. technique can encourage multiple-births only where the cow comes in oestrus within a few days of injection. Should the first, post-injection, oestrus be missed, or the animal fail to show the usual symptoms of oestrus, then at subsequent matings ovulation rate is normal. In applying the present P.M.S. technique, it has been found that one problem in cattle is that of "silent" or "still" heat, *i.e.*, the condition where ovulation is unaccompanied by oestrus.

Of 485 cattle for which information is available, 70 (14.4 per cent.) suffered from "silent heat." It has been observed during every month of the year, and results do not point to any seasonal trend in the incidence of the condition. Information is given in Table VII.

Cattle injected with low dosage levels of P.M.S. appear more prone to suffer from "silent heat" than do those receiving doses of 1,600 to 2,000 I.U. Results are shown in Table VIII.

Unknown at the present time is the incidence of "silent heat" in the untreated animal. It is by no means uncommon for the stock-owner to observe it among cattle in his herd ,but whether it reaches the figure of 17.3 per cent. (that observed in cattle injected with the lowest dosage level) is not known, although evidence in American work suggests that it may. Trimberger and Fincher (1956) found, among 500 oestrous cycles of 200 cows, that 37.4 per cent. of intervals were over 25 days and that approximately one-half of these irregularly long intervals were due to "silent heat."

There is possibly an association between "silent heat" and lactation. If data are examined to take account of the use made of the cow, it is observed that "dry" cows are less likely to suffer than those lactating, and that animals engaged in suckling 3 to 4 calves show the highest incidence. Analysis of data for factors such as age, breed and body condition shed little light on the reasons underlying the occurrence of "silent heat."

The present view is that, while P.M.S. injection probably does not give rise to the condition of "silent heat," it does little to relieve it. Certainly, there is little to suggest that treatment causes premature ovulation, for cows showing "silent heat" usually come in oestrus about 25 days after the time of treatment. This interval indicates that the cow goes the normal period prior to ovulating after P.M.S. administration, *i.e.*, 3 to 4 days. While most cows come in oestrus after one ovarian cycle, approximately 33 per cent. of them do not return to regular breeding until 2 or more ovarian cycles have passed. Even if P.M.S. therapy be held to cause some instances of "silent heat," it seems improbable that it would lead to prolonged absence of breeding activity.

The Percentage of Cattle Conceiving

Of the 415 cattle which have been examined for ovulations, following oestrus and insemination, data are available for 404 which have passed at least 2 months from the time of post-injection insemination. The percentage of these found pregnant when examined or checked, at approximately 6 weeks after first insemination, is 77.7. This figure compares favourably with that for ordinary cows inseminated in the area of operations. Information on the percentage of cows conceiving, in relation to hormone dose and number of eggs shed, is shown in Table IX.

When conception percentage is examined in relation to the dosage level of P.M.S. employed, little difference exists among the groups. There is some tendency for conception to be higher where the larger doses were employed.

Conception percentage is usually more satisfactory in cattle that produce many eggs than in those that produce one. It can be reasonably argued from these figures that P.M.S. therapy (over the dose range employed) does not give rise to serious defects in the fertilisation process. A majority of cattle that produced many eggs were found to be pregnant, with at least 1 foetus, 6 weeks after insemination. This finding was not altogether expected, since previous studies in superovulation in the cow (Dowling, 1949) suggest that fertilisation may not occur, if a

TABLE VII
MONTHLY INCIDENCE OF SILENT HEAT

(Data for years 1959 and 1960 combined)

Month of occurring	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	All
Number cattle injected	25	14	26	34	68	69	59	46	24	38	47	35	485
Number of S. heats	2	2	5	5	8	13	8	7	3	3	9	5	70
Per cent. with S. heat	8·0	14·3	19·2	14·7	11·8	18·3	13·6	15·2	12·5	7·9	19·1	14·3	14·4

TABLE VIII
INCIDENCE OF SILENT HEAT IN RELATION TO P.M.S. DOSAGE LEVEL

	800 i.u.	1,000 i.u.	1,200 i.u.	1,600 i.u.	2,000 i.u.	All doses
Cows injected	121	171	49	15	129	485
Number of S. heats	21	26	7	1	15	70
Per cent. with S. heat	17·3	15·2	14·3	6·7	11·6	14·4

TABLE IX
PERCENTAGE OF INJECTED COWS PREGNANT AT 42 DAYS IN RELATION TO HORMONE DOSE AND NUMBER OF EGGS SHED

		Number of eggs produced							
		1	2	3	4	5	6	6+	Total
800 i.u.	Total cattle...	67	27	3	2	1	—	—	100
	Pregnant at 42 days ...	46	26	3	2	1	—	—	78
	Per cent. conception ...	68·7	96·3	100·0	100·0	100·0	—	—	78·0
1,000 i.u.	Total cattle...	92	31	10	5	3	2	2	145
	Pregnant at 42 days ...	66	25	9	3	2	2	2	109
	Per cent. conception ...	71·7	80·6	90·0	60·0	67·0	100·0	100·0	75·0
1,200 i.u.	Total cattle...	28	3	5	2	—	1	3	42
	Pregnant at 42 days ...	21	2	4	2	—	1	3	33
	Per cent. conception ...	75·0	67·0	80·0	100·0	—	100·0	100·0	78·6
1,600 i.u.	Total cattle...	7	3	2	1	—	—	1	14
	Pregnant at 42 days ...	5	3	2	1	—	—	1	12
	Per cent. conception ...	71·4	100·0	100·0	100·0	—	—	100·0	85·7
2,000 i.u.	Total cattle...	47	13	10	6	5	6	16	103
	Pregnant at 42 days ...	36	10	8	6	4	5	13	82
	Per cent. conception ...	76·6	76·9	80·0	100·0	80·3	83·0	81·3	90·1
All doses	Total cattle...	241	77	30	16	9	9	22	404
	Pregnant at 42 days ...	174	66	26	14	7	8	19	314
	Per cent. conception ...	72·2	85·7	86·7	87·5	77·8	88·9	86·4	77·7

large number of eggs is shed. However, if serious defects in fertilisation did arise in cows producing many eggs, in the present study, then it would be expected that total failure would often occur and the cow be non-pregnant at 6 weeks. While there can be no certainty, in the absence of egg recovery studies, the present indication is that at least some eggs are fertilised where a large number is produced.

In sheep, there is some evidence that conception percentage suffers where a long period separates time of P.M.S. injection and the onset of oestrus (Wallace, 1954). Most cows have come in oestrus a few days following injection, but those which have not shown oestrus until 7 or more days appear to conceive just as readily. Where conception is considered in relation to factors such as age, breed and season of year, there is no suggestion that injected cattle differ from those untreated. There is no evidence that animals possessing unovulated follicles (at time of first examination after treatment) conceived less readily than those which did not. Twenty-six cattle, for example, of the 103 injected with 2,000 I.U., possessed at least one unovulated follicle when checked a few days after oestrus. Twenty of these (76 per cent.) became pregnant.

Egg Loss in Early Pregnancy

The figures on the number of eggs surviving (as foetuses) in the sixth week after mating, in relation to the number of eggs produced, show that there is a heavy loss in eggs during the early part of pregnancy. Data show almost a 50 per cent. reduction in the proportion of cattle sustaining multiple-foetuses from that initially shedding additional eggs.

In none of the injected cattle, regardless of the number of eggs produced, have more than 5 foetuses been sustained. This is shown in Table X, which sets out the relationship between the number of foetuses and the number of eggs initially produced by the cow.

It is evident that cows have the best chance of possessing multiples where they have produced 3 or more eggs. Reduction to a single foetus seems particularly liable in cattle that produce 2 eggs only. There is some suggestion that the size of the litter sustained at 6 weeks is likely to be as great in cows that produce 4 to 6 eggs as in those that actually start with a greater number of ovulations. It may be, in cows that produce a large number of eggs, that struggle for survival is so great that the outcome is for a smaller number to develop into viable foetuses.

This question of egg survival may be examined further if attention is confined to those animals which produced 2 eggs only.

Egg Loss in Cows Producing 2 Eggs

Of 77 cattle that were found to have 2 ovulations (Table X) 66 conceived at first insemination and each possessed either 1 or 2 foetuses when examined at 6 weeks. It is of interest to note that the chances of survival of both eggs is better in cows producing one egg in each ovary than in those where both

TABLE X
FOETUSES PRESENT AT 42 DAYS IN RELATION TO NUMBER OF EGGS SHED BY THE COW

Ovulations	Total cows	Number of foetuses						Cows with multiples	As per cent. of total cows
		0	1	2	3	4	5		
Single egg	241	67	174	—	—	—	—	Nil	Nil
2 eggs	77	11	38	28	—	—	—	28	36·4
3 eggs	30	4	6	12	8	—	—	20	67·0
4 eggs	16	3	—	5	6	2	—	13	81·3
5 eggs	9	2	1	4	—	1	1	6	67·0
6 eggs	9	1	2	2	3	1	—	6	67·0
7—10 eggs	8	1	3	2	2	—	—	4	50·0
11—16 eggs	9	2	—	4	3	—	—	7	77·7
17—25 eggs	5	—	1	1	2	1	—	4	80·0
All cows	404	91	225	58	24	5	1	88	21·4

TABLE XI
EGG LOSS IN RELATION TO SITE OF OVULATION IN COWS SHEDDING TWO EGGS

	Foetuses Present at 42 Days		
	Both ovulations in left	1 ovulation in each ovary	Both ovulations in right
Cows pregnant at 6 weeks	7	39	20
Cows with 2 foetuses	2	23	3
Per cent. to sustain both foetuses	28·3	59·0	15·0

ovulations occur in the one ovary. Details are in Table XI.

It seems that an egg is sustained more ably where it has a uterine horn to itself than where it is competing for survival with a second. It should be mentioned here that movement of eggs between uterine horns hardly ever seems to occur in the cow, although it is a common occurrence in the ewe. In no instance, where 2 or more eggs have been shed by 1 ovary only, has a foetus been found in the opposite uterine horn. In examinations conducted, only 1 cow showed evidence of egg migration. This was an animal which had a corpus luteum in the right ovary and a foetus in the left uterine horn.

It may be that survival of the egg depends on some material in limited supply in the cow's uterus. The reason why one egg should be able to go ahead and the other fail is not at all clear, but possibly one starts uterine life with some initial advantage which enables it to develop at the expense of its neighbour.

Cattle Producing 3 and More Eggs

In cattle producing 3 or more eggs, the proportion possessing multiples at 6 weeks is much higher. Examination of the 73 cattle in this category revealed that multiples were present in 60 instances (in 82 per cent. as against 42 per cent. in cattle producing only 2 eggs.) The main reason for this is that most cattle which produce 3 or more eggs ovulate in both ovaries, and eggs are distributed between the 2 uterine horns. Where a cow produces many eggs, there appears to be association between the number of foetuses surviving in a uterine horn and the number of eggs shed by the corresponding ovary.

If an ovary sheds 5 or 6 eggs, there appears to be a greater chance of twins developing in the associated uterine horn than where the ovary sheds a much larger number of eggs. Such a trend is shown in Table XII. The animals dealt with are mainly those which produced a moderate number of eggs in one ovary and a substantially larger number in the other. The possibility of carrying a litter of 3 to 4 calves is probably less where the animal produces many eggs in each ovary (10 to 15) than where ovaries respond to a moderate extent (5 to 6). In this, however, it is assumed that eggs were fertilised and descended into the uterine horns in a normal way.

TABLE XII
FOETUSES AT 42 DAYS IN RELATION TO NUMBER OF EGGS SHED BY THE OVARY

Animal number	Number corpora lutea in left ovary	Number foetuses in left uterine horn	Number corpora lutea in right ovary	Number foetuses in right uterine horn
114	10	(1)	5	(2)
237	5	(2)	10	(0)
308	6	(2)	15	(1)
315	10	(1)	15	(0)
323	6	(2)	12	(2)

Multiple-Pregnancy in Relation to Dose of P.M.S.

It has already been observed that in 314 cattle which conceived at first insemination, 88 possessed multiples at the sixth week of pregnancy, *i.e.*, 28 per cent. Results show that use of a dosage level of 2,000 I.U. almost doubles the proportion of cows carrying multiples found at 800 I.U. It may be seen, in Table XIII, that there is an increase in the percentage of cows carrying multiples over the dosage range employed. The Table also sets out those carrying multiples in relation to number of eggs shed for each dosage level. Multiples, in the form of

TABLE XIII
MULTIPLES AT 42 DAYS IN RELATION TO DOSE OF P.M.S. AND NUMBER OF EGGS SHED

P.M.S. Dose		Number of eggs shed after injection							
		1	2	3	4	5	6	6+	All
800 i.u.	Cows injected	67	27	3	2	1	—	—	100
	Conceived	46	26	3	2	1	—	—	78
	With multiples	—	10	3	2	1	—	—	16
	Per cent. with multiples	—	38·5	100·0	100·0	100·0	—	—	20·5
1,000 i.u.	Cows injected	92	31	10	5	3	2	2	145
	Conceived	66	25	9	3	2	2	2	109
	With multiples	—	13	7	2	2	2	1	27
	Per cent. with multiples	—	52·0	77·7	67·0	100·0	100·0	50·0	24·8
1,200 i.u.	Cows injected	28	3	5	2	—	1	3	42
	Conceived	21	2	4	2	—	1	3	33
	With multiples	—	0	3	2	—	1	3	9
	Per cent. with multiples	—	Nil	75·0	100·0	—	100·0	100·0	27·3
1,600 i.u.	Cows injected	7	3	2	1	—	—	1	14
	Conceived	5	3	2	1	—	—	1	12
	With multiples	—	1	1	1	—	—	1	4
	Per cent. with multiples	—	33·3	50·0	100·0	—	—	100·0	33·3
2,000 i.u.	Cows injected	47	13	10	6	5	6	16	103
	Conceived	36	10	8	6	4	5	13	82
	With multiples	—	4	6	6	3	3	10	32
	Per cent. with multiples	—	40·0	75·0	100·0	75·0	60·0	76·9	39·0
All doses	Cows injected	241	77	30	16	9	9	22	404
	Conceived ——	174	66	26	14	7	8	19	314
	With multiples	—	28	20	13	6	6	15	88
	Per cent. with multiples	—	42·4	88·6	92·9	85·7	75·0	78·9	28·0

triplets and quadruplets, are more common at the higher dosage levels than at the lower.

Twenty-eight per cent. of all multiples carried by cows injected with 800 to 1,000 I.U. were in the form of triplets or a larger litter number, as compared with 40 per cent. for animals injected with 1,200 to 2,000 I.U. doses. At the lower dosage levels, 4.7 per cent. of multiples represent litters of more than 3, while at the higher levels the corresponding percentage is 8.9.

The data on egg loss have been studied to determine whether breed, age, season of year and such factors are related to the survival of multiples, but there is no present indication that they are. The observed loss in eggs presumably takes place in the first few weeks after mating, for evidence of abnormally developing foetuses has not been found at the time of diagnosis in the sixth week of pregnancy.

Loss in Foetuses after the Sixth Week of Pregnancy

Of the 415 animals for which detailed information is available, 200 have now passed at least 10 months from time of insemination. One hundred and twenty-seven of these produced calves to first insemination. The difference between the percentage of cows calving (63.5 per cent.) and the percentage pregnant at 42 days (76.5 per cent.) arises from instances of total litter loss occurring after the sixth week of pregnancy. Twenty-seven animals, of the 153 pregnant at 6 weeks, lost their young later. In cattle where pregnancy diagnosis was conducted, foetal loss was more frequent than where no examination was made. This is shown in Table XIV. While the indication here is that loss is associated with the examination, this need not necessarily be the main cause for it.

Further information on total litter loss is available for cows which have been diagnosed for pregnancy, but have not yet reached calving. Four of 62 such cattle, pregnant with 1 foetus, have suffered total litter loss and returned in oestrus.

TABLE XIV
LOSS RECORDED IN FOETUSES AFTER THE TIME OF PREGNANCY DIAGNOSIS

	No Pregnancy Diagnosis	Pregnancy Diagnosis carried out	
	Cows with singles	Cows with singles	Cows with multiples
Cows pregnant at 6 weeks	75*	42	36
Cows to lose all foetuses	5	10	11
Per cent to suffer loss	6·7	23·8	30·6

* — includes 4 cows which calved twins.

Of the 88 instances of cows possessing multiples at 42 days (see Table XIII), 40 have already been dealt with in the 200 cattle which yielded calving information. In the remaining 48 cases of multiples which have not yet reached term, it is first necessary to omit 18, since an attempt was made to control size of litter in these.

Thirty animals remain, all examined at 6 weeks and found in possession of multiples. Present results show that 9 of these have suffered total loss of litter, *i.e.*, 30 per cent. In nearly every instance of loss, the evidence points to resorption of the conceptus rather than abortion. Cows have come back in oestrus, usually within a few months of examination.

When litter loss in cows possessing multiples is considered in relation to number of eggs produced, there does appear to be some association between egg number and loss. This is shown in Table XV.

In this are listed the 70 animals with multiples on which no attempt was made to control litter-size. Those cows which produced many eggs appear more liable to sustain total litter-loss, regardless of the number of young present at 6 weeks.

Results, although they await confirmation from calving evidence, pose the question of the effect on pregnancy of numerous corpora lutea. It may be that the hormone balance necessary for maintenance of pregnancy is unduly disturbed by a large number of corpora lutea and the possible change in the usual level of progesterone. At the same time, evidence is available for one animal that produced 15 eggs and gave birth to twins subsequently; it is not necessarily the case that pregnancy failure occurs in the presence of many corpora lutea.

Pregnancy Diagnosis Examination

Examinations have been conducted over a period ranging from 35 to 101 days; most have fallen 41 to 44 days after mating. As a result of experience gained in the earlier part of the Trial, it seems that the most appropriate time for establishing multiple-pregnancy is as close as possible to the 42nd day of pregnancy. Where examinations are made prior to the 40th day of pregnancy, difficulty is often experienced in locating foetuses as a result of tensing of the uterine walls. On the other hand, if diagnosis is delayed until some days after the 6 weeks stage, the accumulation of fluids associated with the conceptus makes location of the amnions most difficult.

Even where the cow is examined at the optimum time for locating amniotic vesicles (42nd day) it may often be difficult to determine the precise number. Where a single egg has been shed by each ovary examination can be fairly easy. Where more than 1 egg is produced by an ovary, and the associated uterine horn is pregnant, the location of foetuses may prove difficult.

TABLE XV
LOSS IN FOETUSES AFTER SIXTH WEEK IN RELATION TO NUMBER OF EGGS SHED

Number of eggs shed by the cow	Foetuses present at 42 days	Foetuses lost later in pregnancy	Percentage cows to lose foetuses
2 Eggs	38—Singles	7	15·2
	28—Twins	3	
3 Eggs	6—Singles	2	33·3
	12—Twins	6	
	6—Triplets	0	
4 Eggs	5—Twins	1	37·5
	3—Triplets	2	
5 Eggs	1—Single	0	33·3
	4—Twins	2	
	1—Quintuplet	0	
6 Eggs	2—Singles	0	25·0
	2—Twins	0	
	1—Triplet	1	
More than 6 Eggs	4—Singles	2	58·3
	7—Twins	4	
	1—Triplet	1	

Controlling Litter-Size

In 18 cattle, all possessing either 3 or 4 foetuses at the 42nd day of pregnancy, an attempt was made to control litter-number to 2. This was done by rupture of "excess" amniotic vesicles by manipulation *per rectum*. At present there is no indication that this procedure is likely to prove satisfactory, for none has yet produced calves.

Calvings

As earlier noted 200 of the 415 animals inseminated immediately after injection have now passed at least 10 months from time of treatment. The calvings of 127 (63.5 per cent.) cattle which conceived at first service have been recorded; 29 of these have borne multiples, *i.e.*, 22.8 per cent. The multiples have consisted of 22 sets of twins, 6 sets of triplets and 1 set of quintuplets. Leaving aside animals which suffered from "silent heat," cattle that failed to conceive to first insemination and those that lost their young at some time in pregnancy, treatment with 800 to 1,000 of P.M.S. has led to approximately 1 cow in 5 producing multiples.

As a result of pregnancy diagnosis most farmers were aware of the fact that their cows were carrying twins. Owners were encouraged to provide the animals with at least an additional 2 cwt. of concentrate feed during the final months of pregnancy. Given such preparation twins and occasionally triplets have usually been born healthy and strong. Twins have been little below the weight of single calves born to other animals in the herd. Cows have calved without loss in condition and returned normally to regular breeding. Information on the calving situation, as affected by husbandry, is too limited to allow remarks to be usefully extended at this stage. Data will be built up as calvings occur through 1961.

Multiple-Calving Rate

In the results presented it has been observed that some proportion of cows suffer from "silent heat"; others fail to respond to the P.M.S. injection; in

those that do give rise to additional eggs there are some which suffer conception failure, some that suffer reduction to a single foetus regardless of eggs shed, some that suffer total litter loss after possessing multiples early in pregnancy and a few that suffer partial litter loss. When all losses are taken into account, what do they mean in terms of the number of cattle that produce multiples for every 100 injected?

At present this information is available for one dosage level (800 I.U.) and is given in Table XVI.

TABLE XVI
PERCENTAGE WITH MULTIPLES WHERE 800 I.U. DOSE OF P.M.S. IS EMPLOYED

P.M.S. dose (i.u.)	Number cows injected	Number in oestrus a few days after injection	Number of cows that ovulated	Produced additional eggs	Pregnant at 6 weeks after A.I.	Pregnant at 6 weeks		Cows to calve multiples	Per cent of total cattle injected to calve multiples
						With singles	With multiples		
800	121	100	99	33	78	62	16	14	11·6

Thus 11.6 per cent. of cattle that were given this treatment gave birth to multiples. Although calvings are not completed for the 1,000 I.U. dosage, it is anticipated that a very similar figure will apply for that. The final figures for doses 1,200 to 2,000 I.U. have to wait on the calvings which continue through 1961.

Concluding Remarks

It must be emphasised that the present empirical approach marks but one step in the development of a satisfactory practical technique for inducing twin-pregnancy in the cow. A great amount of experimental work remains in dealing with the technical aspects of treatment, as well as in showing the economic advantage of twins once they are born.

Undoubtedly, P.M.S. can be successfully employed, as an injection in the follicular phase of the oestrous cycle, to induce the release of additional eggs. The evidence for low dosage levels, which is fairly complete at this stage, shows that treatment does not affect ovulation, fertilisation and conception phenomena in a detrimental way. It is evident that low dosage treatment (800 I.U.) is fairly effective in confining number of ovulations in responding animals to 2. The present difficulty with low dosage treatment lies in the rather small (33 per cent.) percentage of cattle that do respond.

Whether this percentage can be appreciably increased by modification of the present technique must await further study. Certainly, there is need for more precise information on response in relation to nutritional status of the cow. It may be possible to obtain better results where P.M.S. is used in a form more slowly absorbed or where used in conjunction with other hormones, such as oestrogen or progesterone. While there is nothing to suggest that reliable control cannot eventually be achieved over ovulations, much more wants to be known about the factors governing ovarian response to hormone administrations.

As seen in this trial, an immediate source of loss for twinning is the cow with "silent heat." It may be a problem of determining more about the circumstances surrounding this defect in normal cows, and injecting only those least prone to the condition. A different approach might be by way of a modification of the present technique to render time of ovulation independent of the animal's oestrous cycle; appropriate use of P.M.S. in conjunction with progesterone may bring eventual solution to the problem.

While many avenues remain to be explored in getting a higher percentage of cattle to produce 2 eggs, there will always be the problem of how to deal with cattle that produce more than that number. With 800 I.U., in this work, cows have carried triplets and quintuplets, although most multiples have been twins. It may be possible to deal satisfactorily with triplets under ideal conditions of cow constitution, feeding and management, but for any general farm application they can only be regarded as objectionable; arguments against quadruplet and quintuplet births are even stronger.

There is an obvious need for developing a reliable method for controlling the number of calves carried by the cow to 2. Philipsen (1956) reported disappointing results in attempts to control twin-births by rupturing the amniotic vesicle or crushing the embryo in early pregnancy. As observed in this work, the method appears equally unsatisfactory when applied as a means of reducing litters of 3 and 4 to twins.

There remains the possibility of preventing triplet-pregnancy by rupture of follicles in excess of 2 at the time of insemination. Philipsen did report the prevention of natural twin-pregnancy by squeezing one follicle; of 47 cows undergoing this control, 34 became pregnant and produced only single calves. It would seem worth considering a similar procedure for cattle that respond mildly to P.M.S., *e.g.*, those injected with 800 I.U. Control applied immediately prior to ovulation would have the advantage that knowledge of response to P.M.S. would be obtained at the time of routine insemination, and the farmer given some guidance on the possibility of the cow eventually producing twins.

While there are possible ways of getting a useful percentage of cattle to start pregnancy after egg number is held at 2, there remains the problem of

advising the farmer whether his cow possesses 1 or 2 calves as it approaches parturition. In the present study, the view is formed that palpation of the conceptus 5 to 6 weeks after mating is unsatisfactory for general application. A simple method for twin-pregnancy diagnosis in the seventh month of pregnancy would be particularly useful. Present results show that injection with 2,000 I.U. of P.M.S. gives rise to a reasonable percentage of cattle with multiples at 6 weeks (39 per cent. of those conceiving). Questions of the effect of numerous corpora lutea on the normal maintenance of pregnancy and on the subsequent breeding of the cow are yet to be answered. In view of the extreme variability in ovulation response noted with this dosage, and difficulty in applying control on the number of eggs released, where ovaries are greatly stimulated, there seems no immediate hope of adopting such high dosage treatment as a practical measure.

The authors wish to express grateful thanks to members of the veterinary profession and Ministry of Agriculture officers for interest and help at different times. Finally, we are much indebted to all those farmers who have co-operated with the Board in the project. Without their support the trial would not have been possible.

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NEW PIDA HERDS REGISTER

Details of 670 pedigree herds are included in the Pig Industry Development Authority's first register of provisionally accredited herds which was published on April 10th.

The herd details are classified in alphabetical order under breeders' names and herd prefixes. For easy reference an appendix gives names of producers under county headings. Average results for each breed are also shown.

At present the main requirement for membership is that a herd must have been recorded under Part I of PIDA's recording scheme for at least a year. Members must agree to submit boars for testing. At the moment no rules have been laid down concerning the numbers which should be tested from an individual herd. Eventually an accredited herd will use only approved, tested boars or their full brothers or sons.

Members included in the register are receiving copies free of charge but additional copies can be bought, price 5s. 0d., from any PIDA regional office or from PIDA House, Ridgmount Street, London, W.C.1.

Some Observations on Bovine Farcy

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SUMMARY.—Bovine farcy is a rare disease in most parts of the Sudan but is common in the Nuba Mountains and neighbouring areas.

The morphology and staining properties of the organism are described.

Two cases of udder infection believed to be part of generalised infection are described and discussed.

Introduction

BOVINE farcy, or bovine lymphangitis as it was then called, was recorded in this country for the first time in 1929 (Annual Report of the Sudan Veterinary Service, 1929) when examination of material from a bull in the Nuba Mountains revealed the presence of an organism indistinguishable from *Actinomyces farcinicus*. The veterinary inspector who sent the material to the laboratory reported that the condition was well known to the local cattle owners, but they did not bring it to the notice of the authorities earlier as losses from it were negligible.

Closely related conditions have also been observed in other animals in this country. Mason (1919) described an actinomycosis in a Sudanese camel that died in Egypt shortly after its import from the Sudan in 1917. Tubercle-like lesions were present in the internal organs and superficial lymphatic glands. Scrapings from the lesions showed a streptothrix which he proposed to name *Streptothrix cameli*. An organism morphologically indistinguishable from *A. farcinicus* was also reported in abscesses from 3 dogs in Khartoum, and in a pus smear from a horse in Southern Kordofan (Annual Report of the Sudan Veterinary Service, 1942).

In recent times Awad and Karib (1958) investigated bovine farcy and found that 2 distinct forms of the disease occurred in the Sudan: a chronic purulogranulomatous inflammation of the subcutis involving the lymph vessels and nodes, which might or might not be accompanied by internal lesions, and an exclusively internal type, the pulmonary form, which closely resembled tuberculosis. They also found that in some lesions, especially those which had undergone caseation and partial calcification, the filaments had broken down into small rods resembling tubercle bacilli and that it was only possible to differentiate with certainty between farcy and tuberculosis by guinea-pig inoculations.

Awad (1958) had shown that bovine farcy was common, especially in the south, and that *A. farcinicus* may sensitise the animal to tuberculin. He also described (1960) nocardiosis of the bovine udder and testis.

This paper records some observations which were made on bovine farcy in the Southern Sudan during the past 2 years.

Field Observations

During 1959 all districts—except Renk—of the Upper Nile province were toured by the writer to survey the incidence of bovine brucellosis. During this survey, close watch was kept to detect any cases of bovine farcy. No suspected cases could be seen in Bor, Nasir, Akobo, Fangak, Bentiu Pibor and Malakal, districts—with the exception of Malakal town. It was only in Kodok district on the west bank of the White Nile, and in Malakal town, that a few cases could be found. On the way to Bentiu, near Liri on the Nuba Mountains, some Arab herds were seen; the number of cattle showing signs of bovine farcy in these herds was striking. In 1 herd about 15 per cent. of the animals appeared to be affected and most of the swellings were on the prescapular region. This is not at all surprising as the Nuba Mountains is an area where the disease is widespread.

Case Reports

Case No. 1

A 2½-year-old bull was brought, with 25 other animals, from Kodok district for use in rinderpest tissue vaccine production. This animal was in poor condition and showed a swelling nearly the size of an egg on the left shoulder. This was discharging pus, and the prescapular lymph gland was enlarged. Pus smears revealed organisms morphologically identical with *A. farcinicus*. This animal was kept separately and died 2 weeks later. *Post-mortem* examination revealed many tubercle-like nodules in the lungs, spleen and liver. The organism was demonstrated in smears from these lesions.

Case No. 2

A bull of about the same age, and from the same batch as case No. 1, was showing 3 swellings on the neck and the prescapular lymph gland was also enlarged. The animal was in fairly good condition. One abscess was opened and pus smears showed *A. farcinicus*. The animal was killed immediately but thorough examination of the internal organs failed to reveal any macroscopic lesions.

Case No. 3

A 4-year-old heifer (Fig. 1) was brought to the veterinary hospital at Malakal for treatment. Numerous nodules of varying sizes covered the perinaeum, extending from the root of the tail to the udder. On palpation the udder was found to be an indurated mass and all quarters were affected. A small amount of pus was drawn with difficulty through the teat and on microscopic examination showed *A. farcinicus*. It was not possible to follow this case.

Case No. 4

A 7-year-old cow (Figs. 2 and 3) was brought with others from the Nuba Mountains in 1958 for use in trypanosomiasis research work. During October, 1959, this cow developed 3 nodules on either side of the vulva. They were opened for treatment and were found to contain pus in which *A. farcinicus* was demonstrated. The animal was isolated and kept under observation; more nodules developed and spread gradually over the whole of the perinaeum. The udder remained normal at first, the milk showed no alteration and no organisms could be seen in it. Through an oversight milk from this cow was fed to a group of mice for over a week. These mice were observed and killed at weekly intervals; *post-mortem* examination failed to reveal any farcy lesions. Two months later, the udder of the cow showed hard nodules on palpation. These nodules increased gradually in size and the secretion from the udder contained pus in which the organism could be seen. The animal was losing condition and died 7 months after the appearance of the first nodules. Numerous nodules of varying sizes were seen in the lungs, liver, spleen and udder, at autopsy, and smears from these lesions revealed *A. farcinicus*.

In addition to the 4 cases described above many other cases were seen during routine diagnosis.

Bacteriology

Attempts to grow the organism on nutrient, serum and blood agar, and nutrient and serum broth, were not successful. The morphology and staining properties of the organism were studied. A large number of smears were prepared from different lesions—those which contained pus, caseated, and partially calcified, material—and variously stained.

It was found that the organism could readily be stained with methylene blue, Gram's, Claudius's and Ziehl-Neelsen's stains. When using methylene blue it was observed that pus material stained more deeply and frequently masked the organism when thick smears were used. This could be overcome by preparing thin smears or washing with methyl alcohol for half a minute after staining. With Ziehl-Neelsen's method the organism could be stained with or without application of heat (using strong or dilute carbol fuchsine). Three per cent. acid alcohol was used to decolorise for 3 minutes. The organism is acid-fast and Gram-positive.

In smears from lesions the organism appears as masses of fine branching filaments which tend to stain uniformly when the smear is taken from a young lesion, but in the majority of cases ovoid enlargements are seen along the course of the filaments giving them a beaded appearance (Fig. 4). This is more evident when Gram's stain is used but can also be seen with Ziehl-Neelsen's. In older lesions the filaments appear as if they have broken up into small coccal forms, but they do not appear to break free and scatter separately.

Discussion

Bovine farcy is a rare disease in Upper Nile province and most other parts of the country. It is common in the Nuba Mountains and to a lesser degree in neighbouring areas in Kodok and Kosti districts (Imbabi and Gillespie). It is believed that the disease was introduced into these areas by nomadic owners from the Nuba Mountains.

Awad (1958) reported that bovine farcy is a common disease in the south but his observations

were not made on a field survey and were restricted to Malakal town. Malakal is the largest town in Upper Nile province and is perhaps the only town where a large number of cattle are slaughtered daily for food. It has a cattle market to which animals are brought from different localities. In addition, nomadic Arabs from Kordofan come every year to spend the dry season at Malakal in search of grass and water for their flocks; while there they sell some of the stock to butchers.

In the many smears examined it was not possible to see filaments that had broken down into small rods resembling tubercle bacilli as described by Awad and Karib (1958). According to Daubney (1927) the fragmentation of filaments into extremely short rods, which as a rule failed to stain well, was only noticeable when the organism was grown in culture.

Awad (1960) has reported a very interesting condition—nocardiosis of the bovine udder and testis. He had examined 2 living animals showing udder lesions but they were not subjected to a thorough *post-mortem* examination to detect lesions at sites other than the udder. The other cases examined by Awad (1960) were on the slaughterhouse floor and in most of these cases he observed lesions in other organs. It is the opinion of the writer—in view of the 2 cases he describes above—that the cases described by Awad (1960) might, in fact, be a part of generalised infection. Primary infection of the udder and testis still remains to be proved.

Considering the morphology and staining properties of *A. farcinicus*, it appears that these 2 factors will suffice for all practical purposes to reach a correct diagnosis. In the many smears examined branching filaments were constantly seen in all positive cases. It is the opinion of the writer that a correct diagnosis can be established without guinea-pig inoculation as suggested by Awad and Karib (1958).

Acknowledgments.—The writer gratefully acknowledges help from Dr. E. N. Dafaalla, Dean of the Faculty of Veterinary Science, and Dr. C. P. Pillai.

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Generalised Pseudomonas Infection in a Cow

BY

M. R. GARDINER and J. CRAIG

Department of Agriculture, Perth, Western Australia

SUMMARY.—A systemic infection arising from a Pseudomonas *mastitis in a cow is described. Clinically the disease syndrome simulated severe Johne's disease, whilst the main pathological features were chronic pyelonephritis and renal plasmacytosis; adrenal cortical hypertrophy, nodulation and plasmacytosis; fibrinous pleuritis and fibrinous pericarditis; and chronic mastitis. There was a marked hypergammaglobulinaemia.*

Introduction

THERE is a dearth of information in the veterinary literature on systemic infections due to *Pseudomona aeruginosa*. This organism is commonly regarded as non-pathogenic but is occasionally found in human infections of the urinary and intestinal tracts, meninges, lungs and endocardium, as well as in certain ear and skin conditions. The number of reports of human cases of this kind is increasing and is of concern because of the extremely resistant nature of *Pseudomonas* to most antibiotic agents and because of the somewhat intractable course of the infection.

In veterinary medicine, *Ps. aeruginosa* is sometimes found in bovine mastitis although its appearance as an aetiological agent of this disease has coincided with the extensive use of intrammamary antibiotic preparations, and may be regarded as a contaminant of intramammary therapy.

Pseudomonas spp. are not infrequently found in localised conditions in other animal species and have been reported in canine otitis, abscesses and the like. However, the only detailed report of a systemic bovine infection resulting from *Ps. aeruginosa* to come to the notice of the authors was by Winter and O'Connor (1957), who described a case in Queensland in which the infection developed initially as a mastitis and later became generalised. At *post-mortem* examination pneumonia, nephritis, pleuritis, pericarditis and peritonitis were found.

Report of Present Case

In May, 1960, a 9-year-old Guernsey cross dairy cow in the Toodyay district of Western Australia, with a history of persistent scouring of 2 months duration, was examined. The animal was in extremely poor condition but two clinical features were outstanding; one was the scouring which was suggestive of Johne's disease and the other was a very severe chronic mastitis. The cow had been used as a nurse cow during the preceding 8 months and had successfully reared 2 calves prior to the onset of the scouring-mastitis syndrome. Rectal scrapings revealed the presence of a little acid-fast material, not typical of Johne's bacillus whilst intradermal avian tuberculin and complement-fixation tests were

M. El NASRI—SOME OBSERVATIONS ON BOVINE FARCY

FIG. 1.—Nodules of bovine farcy covering perinaeum, root of the tail and udder.

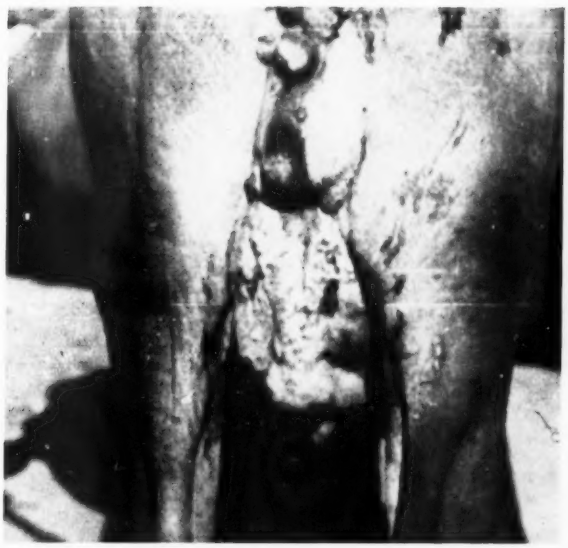

FIG. 3.—Same case as Fig. 2 showing nodules on the udder.

FIG. 2.—Nodules of bovine farcy on either side of the vulva.

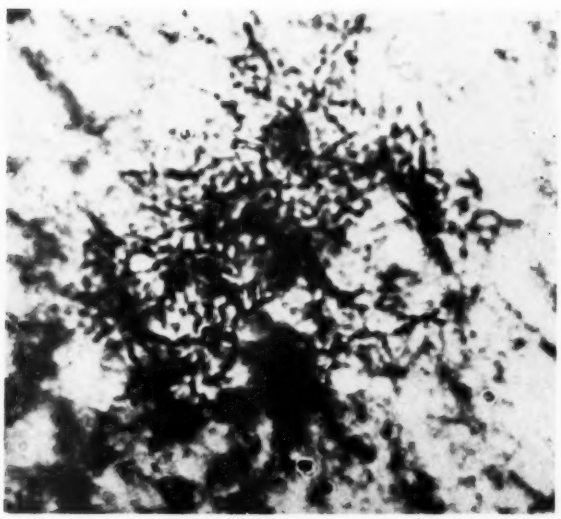

FIG. 4.—Branching filaments of *A. farcinicus* showing a beaded appearance.

M. R. GARDINER & J. CRAIG—GENERALISED PSEUDOMONAS INFECTION IN A COW

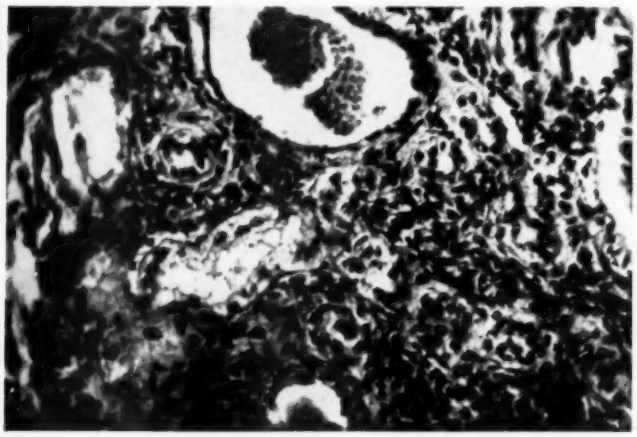

FIG. 1.—Extensive interstitial nephritis and tubular degeneration of the kidney x 288 H. & E.

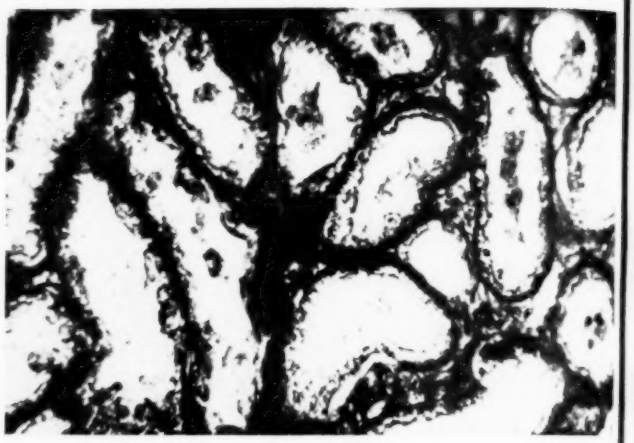

FIG. 2.—Intertubular fibrosis and tubular destruction of the kidney x 288 Mallory's Trichrome.

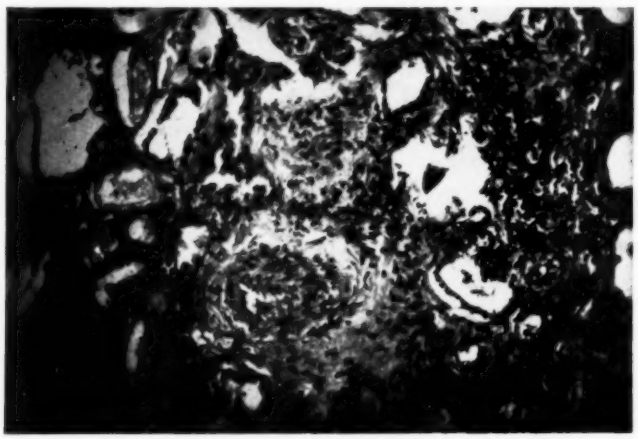

FIG. 3.—Kidney showing arteriolar hyperplastic sclerosis, dilatation of distal convolutes, colloid casts and interstitial nephritis x 144 H. & E.

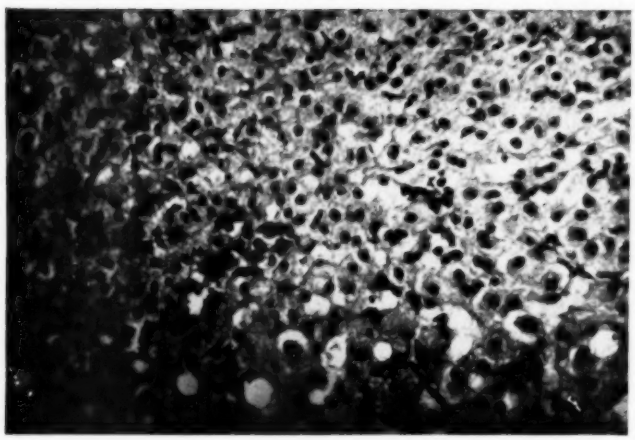

FIG. 4.—Plasma cell foci in adrenal zona fasciculata adjacent to medulla x 288 H. & E.

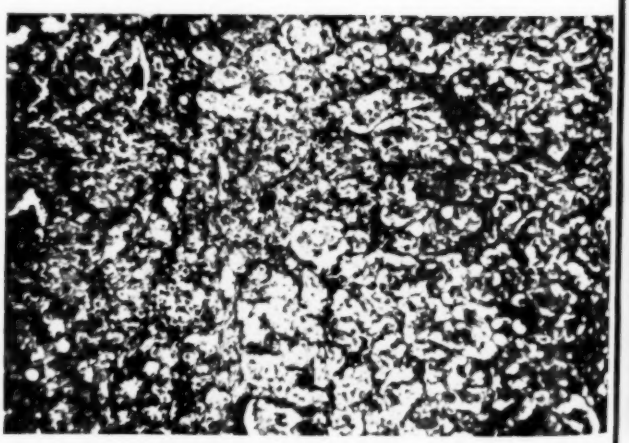

FIG. 5.—Adrenal showing nodular hyperplasia and invasion of reticulin and collagen x 144 AZAN.

completely negative. Pure cultures of *Ps. aeruginosa* were isolated from the mammary gland. The affected quarter was grossly enlarged, and indurated, and yielded a purulent yellow secretion.

About 10 days later the animal was *in extremis*. In order to eliminate Johne's disease as a possible factor in the disease syndrome, it was decided to destroy the cow for further pathological studies. At this time recumbency was complete, the animal being too weak and emaciated even to stand. A fair appetite persisted, however, to the end.

On *post-mortem* examination the following changes were found: diffuse reddening and congestion of the abomasum and, in patches, of the small intestine, throughout its length; very mild thickening of the wall of the colon and most of the rectum; slightly swollen liver with rounded edges; extensive fibrotic streaking of the kidneys; marked adrenal hypertrophy, cortical fibrosis, and cortical nodulation; extensive adhesions of the visceral and parietal layers of the pleura; and chronic fibrinous pericarditis.

Histopathology

The small and large intestines showed moderate chronic inflammatory cell invasion of the lamina propria; the majority of cells were lymphocytes and plasma cells with a few large mononuclear cells. There was no histological evidence of Johne's disease although some of the erythrocytic surface material was intensely acid-fast and probably represented the material seen on rectal scrapings.

The liver showed mild portal fibrosis; a mild diffuse invasion of the portal tracts and lobular parenchyma with plasma cells; slight bile ductule cell proliferations; and mild perisinusoidal oedema.

The kidneys were the most extensively affected of all bodily tissues (except the mammary gland). There was widespread chronic pyelonephritis largely confined to the renal cortices (Fig. 1). The great majority of the cells of the proximal convoluted tubules were showing degeneration while everywhere a lymphocyte-plasma cell infiltrate accompanied by connective tissue was invading the inter-tubular spaces and crowding out the tubules (Fig. 2). The distal convolutes and ascending limbs of Henle were greatly dilated and filled with colloid casts. All the arteries and arterioles showed hyperplastic sclerosis (Fig. 3). There was marked periglomerular fibrosis, patchy streaks of medullary fibrosis and colloid casts in the loops of Henle and collecting ducts in the medulla. A section stained by Goodpasture's method showed numerous Gram-negative rods similar to *Pseudomonas* spp.

The cortices of the adrenals were invaded extensively by plasma cells, especially in the deeper layers adjacent to the medulla. This plasmacytosis was associated with a significant increase in reticulin and collagen fibres. There were cortical nodules and marked hypertrophy of the cells of the Zona fasciculata (Figs. 4 and 5).

Serum Protein Electrophoresis

The normal serum-protein pattern for the bovine animal (Vesselinovitch, 1959) has been reported as albumin 42.5 per cent., α-globulin 11.5 per cent., β-globulin 12.6 per cent. and γ-globulin 33.4 per cent., with an A/G ratio of 0.74. The pattern for the cow under discussion was:—

Albumin 5.7 per cent. α-globulin 16.1 per cent.
β-globulin 12.8 „ „ and γ-globulin 65.4 „ „

and there was a very pronounced decline in the A/G ratio to a value of 0.06.

Discussion

It is interesting to note the basic similarities between our case and that reported by Winter and O'Connor. In both animals, fibrinous pleuritis and pericarditis, and extensive renal lesions were found but the Queensland case was apparently much more acute since the principal infiltrating cell was the polymorphonuclear, whilst in our Western Australian case lymphocytic-plasmacytic invasion was almost completely dominant and this was associated with a tremendous increase in the serum globulin fractions, especially gamma globulin.

The concentration of pathological changes in the renal and adrenal cortices with marked involvement of the renal arterial channels suggests extension of the infection by way of the vascular networks in the area. Many of the renal lesions appear to have an ischaemic-fibrotic basis. The striking dilatation of the ascending limbs of Henle and distal convoluted tubules appears to be a common occurrence in fibrotic kidneys (Sheehan & Davis, 1959).

Acknowledgments.—We are indebted to Mr. A. C. Easther for bacteriology and photography, and to Mr. H. Masters for the serum-protein electrophoresis.

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THE DESIGN OF RESEARCH LABORATORIES

A study of the design of research laboratories was initiated by the Nuffield Foundation in 1954 at the request of the Agricultural Research Council, who also gave financial support to the project. The report on this work is now to be published under the title of "The Design of Research Laboratories."*

The work carried out was of two kinds, original investigation (space and service requirements, design in relation to lighting and the analysis of building costs), and analytical studies of existing data which may reasonably be applied to laboratories. The latter include noise reduction, vibration, fire protection, the design of special rooms, materials and finishes.

The detailed original investigation of the space and services required in a large range of scientific disciplines was carried out by means of a survey which lasted 18 months, and the Agricultural Research Council gave the team access to all its research establishments.

* A Report of a Study carried out by the Division for Architectural Studies of the Nuffield Foundation and published by the Oxford University Press, 45s.

Current Literature

REPORTS

Colony of Fiji : Department of Agriculture Annual Report for 1959.

The colony was again free from the major livestock diseases of the tropics and enjoyed its usual high standard of animal health.

Tuberculosis, which is virtually the only serious disease of cattle in Fiji and responsible for most condemnations in the Colony's slaughterhouses, was again given priority by the veterinary staff. During the year, 18,700 tests were carried out revealing a reactor rate of 1·25 per cent., a substantial drop on the previous year's figure.

A Strain 19 inoculation service is offered free. There was a slight increase in the number (1,666) of calves vaccinated, a fact which the report suggests may indicate a welcome expansion of the dairy industry.

A research project on the epidemiology of parasitic gastro-enteritis of cattle, with the object of formulating rational control measures, was in hand and nearing completion.

Kidney worm (*Stephanurus dentatus*) and tuberculosis were responsible for most condemnations in pigs.

In the absence of any private practitioners all the small-animal work in the colony had perforce to be carried out by government veterinary officers. Heart worm was again very common. Infectious canine hepatitis was seen for the first time in Fiji.

Considerable attention is being paid to animal husbandry and livestock improvement schemes, with emphasis on the production of more and cleaner milk. There are signs that these plans, which entail the use of Jerseys and Friesians, are paying dividends.

During the year the colony's 2 butter factories produced a record amount (300 tons) of butter and a further highlight in the dairying industry was the opening, with government financial support, of a milk processing plant close to Suva.

A foundation herd of Santa Gertrudis imported from the U.S.A. and Australia has been established to improve local beef but it is too early yet to say how the project is going. Experiments are also proceeding with Red Polls and Herefords.

The examination of various grasses with the object of improving pastures continued ; at present the only way to establish a pasture in a reasonable time is by vegetative methods and a grass that will produce a viable seed freely is being sought. So far Buffel grass (*Pennisetum ciliaris*) appears promising.

Several fodder grasses were under trial ; no mention is made, however, of Signal grass (*Brachiaria brizantha*) which has given good results in Ceylon and other parts of the East. W. E. L.

City of Johannesburg : Annual Report of Director, Abattoir and Livestock Market Department, for the period July 1st, 1958, to June 30th, 1959.

In his 1958–9 report the Director, Mr. M. C. Robinson, B.V.SC., gives full statistical details of the large volume of work carried out by his department, work that embraces not only the operation of a very large abattoir but also a wide variety of other veterinary activities.

The staff consists of 160 Europeans, of whom 7 are veterinary surgeons and 196 natives.

During the 12-month period nearly 1,380,000 animals comprising 330,000 cattle, 846,000 sheep and goats, 188,000 pigs, and 15,000 asses, horses, and mules, were slaughtered at the abattoir, figures that are equivalent to a not inconsiderable daily average of 900 cattle, 2,300 sheep and goats, 515 pigs, and 40 equine animals.

Diseased meat and offal seized and condemned amounted to nearly 1,500 tons. A comprehensive appendix to the report gives the various reasons for condemnation, the main ones being stilesia, echinococcal cysts, and lymphadenitis, in sheep, distomiasis in cattle and sheep, and cysticercosis in cattle and pigs. The incidence of " measles," 2·8 per cent. in cattle and 1·3 per cent. in pigs, was slightly higher than in the previous year. Tuberculosis accounted for 50 cattle and 264 pig carcases.

Besides running the abattoir the department is also responsible for treating animals belonging to the City Council. These included 700 mules and horses, 560 trek oxen, a beef herd of nearly 3,500, and a small dairy and pig herd.

Over 1,000 dairy herds were visited and 80,000 cattle inspected. Mange, mastitis, anaplasmosis, babesiosis, quarter-evil, 3-day stiff-sickness, and lumpy skin disease, were among the conditions encountered.

The City milk supply is regularly tested for tuberculosis ; 6 dairy herds out of 1,850 tested were found infected.

As usual the prevalence of contagious abortion was investigated by " ring " screening tests applied to herd milk samples. Any positive samples are submitted to a biological test and the blood serum tested for agglutinins. The proportion of positive reactions was fairly high but, as in previous years, propaganda to persuade dairymen to make more use of Strain 19 vaccine was not entirely successful.

Departmental staff also carried out some 7,500 preventive inoculations against other diseases, including anthrax, horse sickness, quarter-evil, fowl typhoid, and fowl pox. W. E. L.

INTERNATIONAL CATALOGUE OF VETERINARY FILMS

An appendix, to be published in May, 1961, and distributed free to those who have ordered the International Catalogue of Veterinary Films and Films of Veterinary Interest, will list some 60 new films. An additional index will give withdrawals from circulation, and availability outside the country of origin.

Scientific Programme for the 1961 B.S.A.V.A. International Congress

TO BE HELD AT THE KENSINGTON PALACE HOTEL, LONDON, W.8, ON 20th to 23rd APRIL

THURSDAY

10.30 a.m.	*Clinical Seminar.* A series of case sheets to be circulated to the audience and discussed by a panel of 3.	Mr. R. G. Walker, M.A., M.R.C.V.S., Cambridge. (Organiser and Chairman).
12.00 noon	Lunch.	
2.00 p.m.	Delegates will be split into 3 groups, A, B & C, distinguished by tickets, and will move from session to session, each of which will last approximately 45 minutes.	Mr. B. V. Jones, M.R.C.V.S. (Organiser).
	A. Examination of the eye (practical demonstration) (Each group will be sub-divided into 3 for this session)	Mr. F. G. Startup, B.SC., M.R.C.V.S., Worthing. Mr. D. M. Heeley, M.R.C.V.S., Cranbrook. Dr. W. G. Magrane, D.V.M., M.SC., (MED). South Bend, U.S.A.
	B. Examination of the lungs of the dog (clinically and radiographically).	Dr. L. W. Hall, M.A., B.SC., M.R.C.V.S., Cambridge. Mr. S. W. Douglas, M.A., M.R.C.V.S., Cambridge.
	C. Positioning for radiography.	Mr. R. Churchill Frost, M.R.C.V.S., London.
4.30 p.m.	Tea.	
5.00 p.m.	*Film.* Anaesthesia, Relaxation and Positive Pressure.	Mr. G. R. Robbins, M.R.C.V.S., Herne Bay. Mr. P. W. Daykin, B.SC., M.R.C.V.S. (Chairman).
5.30 p.m.	Meeting of the World Small Animal Veterinary Association, open to all delegates.	Dr. W. G. Magrane, D.V.M., M.SC. (MED). (deputising for the President, Dr. Wayne H. Riser). (Chairman). W. Brian Singleton, M.R.C.V.S. (Hon. Secretary).
8.00 p.m.	*Transatlantic Link* American Team : Prof. Wade O. Brincker (Moderator) Dr. Gerry Schnelle Dr. Jacques Jenny Dr. Wayne H. Riser.	British Team : Mr. W. Brian Singleton (Moderator) Mr. Donald D. Lawson Mr. Gordon Knight Dr. Halfden Moltzen.
	Each team will present a clinical case for general discussion.	

FRIDAY

9.15 a.m.	*Annual General Meeting B.S.A.V.A. Part I.*	
10.30 a.m.	*Opening of Congress by The Rt. Hon. Lord Rank.* *Opening of Trade Exhibition.*	
11.00	Coffee.	
11.30 a.m.	Antigenic relationship between rinderpest, measles and distemper.	Mr. R. S. T. Bowden, M.R.C.V.S., DIP. BACT. Dr. Prof. P. Goret, DR. MED. VET. Alfort (Chairman).
12.00 noon	The " flank " approach to abdominal surgery.	Dr. H. H. Thalheimer, The Hague.
12.30 p.m.	The accident case as an emergency.	Mr. P. J. Bottomley, B.SC., M.R.C.V.S., Bradford.
12.30 p.m.	Lunch.	
2.30 p.m.	*Television Procedures.*	Mr. O. Graham-Jones, M.R.C.V.S. (Organiser) London.
Approx :	20 mins. (*a*) A clinical method for blood pressure recording during operations.	Dr. Prof. Nils Obel, D.V.M., Stockholm.
,,	15 mins. (*b*) The management of cardiac arrest.	Mr. W. D. Tavenor, B.V.SC., M.R.C.V.S., London
,,	20 mins. (*c*) Preparation for surgery.	Mr. Andrew Edgson, M.R.C.V.S., Reading.
,,	40 mins. (*d*) Caesarean section under diethylthiambutene hydrochloride and local anaesthesia.	Mr. N. R. Turnbull, F.R.C.V.S., Basingstoke.
	Chairman : Mr. O. Graham-Jones, M.R.C.V.S. Panel : Mrs. K. G. D. Evans, M.R.C.V.S. Dr. W. G. Magrane, D.V.M., M.SC.(MED.) Dr. Prof. S. E. Olsson, D.V.M.	
4.30 p.m.	Tea.	
5.00 p.m.	The Incidence of canine hip dysplasia in Scandinavian Countries.	Dr. Prof. S. E. Olsson, D.V.M., Stockholm. Mr. G. C. Knight, F.R.C.V.S. (Chairman).

SATURDAY

9.15 a.m.	A clinico-pathologic study of canine dermatology.	Dr. R. H. Schwartzman, V.M.D., M.P.H., PH.D., Philadelphia, U.S.A. Mr. C. E. Woodrow, M.R.C.V.S. (Chairman).
10.15 a.m.	Is *Escherichia coli* (*Bacterium coli*) infection of significance in the dog ?	Dr. W. Mansi, M.V.SC., DIP. BACT., Weybridge.
11.00 a.m.	Coffee.	
11.30 a.m.	Ocular surgery (including a colour film on the corneal graft operation in the dog).	Dr. Prof. Filippo Cella, DR. MED. VET., University of Bologna. Mr. J. A. Dall, B.SC., M.R.C.V.S. (Chairman).
12.30 p.m.	Otitis media in the Dog.	Dr. H. Moltzen, Copenhagen.
1.15 p.m.	Lunch.	
2.30 p.m.	*Television Procedures.*	Mr. O. Graham-Jones, M.R.C.V.S., London (Organiser).
Approx :	40 mins. (*a*) Surgical procedures of the cornea.	Dr. W. G. Magrane, D.V.M., M.SC. (MED.), South Bend, U.S.A.
,,	20 mins. (*b*) Anaesthesia of the bad risk patient.	Mr. Holland Birkett, M.R.C.V.S., Aldershot.
,,	60 mins. (*c*) Cuneiform osteotomy of a distorted radius.	Mr. D. D. Lawson, M.R.C.V.S., Glasgow.
	Chairman : Mr. A. Steele-Bodger, M.A., B.SC., M.R.C.V.S. Panel : Mr. D. M. Heeley, M.R.C.V.S. Dr. Prof. Nils Obel, D.V.M. Dr. H. Moltzen.	
4.30 p.m.	Tea.	
5.00 p.m.	Griseofulvin in the treatment of ringworm in small animals.	Miss Olga Uvarov, M.R.C.V.S., Greenford. Mr. K. G. D. Evans, M.R.C.V.S. (Chairman).

(Concluded at foot of page overleaf)

Mr. F. Knight

As recorded in our last issue the death took place in hospital on Monday, April 3rd, of Mr. Frederick Knight, so recently retired General Secretary of the B.V.A. The news of his death has been received with widespread regret, for he was known with respect and affection throughout the profession.

Mr. Knight would have been proud to think that to write of his 35 years' service with the Association is to write of the history of the N.V.M.A. and later the B.V.A. during those years. Throughout that time he *was* the Association to members; their interests were his interests and the B.V.A. is deeply in his debt.

It was in 1925, 5 years after the N.V.M.A. had acquired THE VETERINARY RECORD and was constituted in its present form, that the decision was taken to appoint a lay General Secretary. Later that year Mr. Knight, who had been Assistant Secretary to the R.C.V.S., took up the appointment. It is pleasurable to read the words of the then President of the Association, Professor Buxton, at the 1926 congress of the N.V.M.A. asking the conference to confirm Mr. Knight's appointment:—

"The action taken last year," said Professor Buxton, "was in the nature of an experiment, and of all the experiments with which I have been connected this has been one of the most successful. I am quite sure that everyone feels every satisfaction with the keen and conscientious manner in which Mr. Knight has carried out his duties during the past year."

Mr. Gofton, in seconding the President's motion, said: "I am quite certain that the Association cannot do anything better in its own interest than agree with the recommendation of the Council to re-appoint Mr. Knight as Secretary."

At that time the membership of the Association was 1,519; the annual income was some £5,000, and Mr. Knight presided over a staff of 3 in a 3-room suite on the first floor of 10 Grays Inn Square. By 1930 the membership had increased to 1,662, the annual income exceeded 6,000, and it became necessary to move to more spacious accommodation at 2 Verulam Buildings. By 1937 the permanent staff had increased to 5 and, with a membership of over 1,800 and an income exceeding £7,000, it once again became necessary to move, this time to 36 Gordon Square. Here the Association stayed until 1953, reaching a membership of nearly 4,000 and an annual income exceeding £35,000; the B.V.A. then made its final move to the present headquarters at 7 Mansfield Street. Throughout all these years Mr. Knight was at the helm; from his original staff of 3 he saw the Association grow until, on his retirement, there was a permanent staff of 17 at headquarters.

Just how much of that growth was due to the man who devoted so much of his time to it can only be guessed; there can be no doubt, however, that

B.S.A.V.A. Programme.—*Concluded.*

SUNDAY

9.00 a.m.	Fluid replacement in the surgical case.	Mr. John Watt, B.V.M.S., M.R.C.V.S., Edinburgh. Mr. A. Steele-Bodger, M.A., B.SC., M.R.C.V.S. (Chairman).
9.30 a.m.	Practice profits and pleasure.	Mr. M. Young, M.R.C.V.S., Ealing.
10.15 a.m.	Canine nephritis.	Dr. W. I. M. McIntyre, PH.D., M.R.C.V.S., Glasgow.
11.00 a.m.	Coffee.	
11.30 a.m.	The non-renal clinical changes in chronic nephropathies in dogs.	Dr. F. Persson, LEG. VET. Stockholm. Prof. J. S. A. Spreull, PH.D., M.R.C.V.S. (Chairman).
12.15 p.m.	Ear cleansing in the dog.	Dr. J. Meynard, DR. MED. VET. Bordeaux.
12.45 p.m.	Lunch.	
2.15 p.m.	Canine glaucoma.	Dr. W. G. Magrane, D.V.M., M.SC. (MED.), South Bend, U.S.A. Mr. W. B. Singleton, M.R.C.V.S. (Chairman).
3.15 p.m.	Studies on spinal cord compression in the dog.	Dr. Prof. S. E. Olsson, D.V.M., Stockholm.
4.00 p.m.	Tea.	
4.30 p.m.	The present position of immunisation against canine viral diseases in the U.S.A.	Dr. J. A. Baker, D.V.M., Cornell University, U.S.A. Mr. S. F. J. Hodgman, M.R.C.V.S. (Chairman).
5.30 p.m.	*Closing of Congress and Annual General Meeting B.S.A.V.A. Part II.*	

the B.V.A. is deeply in his debt if only for his organising ability. Only a man of notable qualities could have steered the Association so smoothly through many years, and helped it develop into the great national organisation it is to-day. All who worked with him respected his special abilities and every member who came to the Association for guidance will remember him for his untiring efforts in this interest.

And yet to speak only of the loss which his death means to the Association is not enough; for his work was only a part of a full and happy life. His boyhood outside school hours was spent roaming and fishing near Carnforth in Lancashire, where he was born in 1895. Bolton-le-Sands, Wharton, Silverdale, the Kent Estuary and Morecambe Bay—all were dear to his heart. His first appointment was with the Manchester Corporation in the Meat Inspection department; his superior being the late Colonel Brittlebank, who was at that time working on problems of milk supply. His work with the Manchester Corporation was interrupted in 1914 by the outbreak of war, when he joined the newly started Royal Flying Corps, seeing service in France and Egypt and attaining the rank of Warrant Officer, 1st Class.

After the war he returned to his work in Manchester until Colonel Brittlebank, who was always anxious that the most promising members of his staff should achieve preferment, put forward the name of the young Fred Knight to the Royal College of Veterinary Surgeons, which needed a chief clerk. Older members may recall Mr. Knight's first appearance there supervising the 1922 R.C.V.S. examinations.

A fact which Mr. Knight rarely mentioned was that he sat for the Sanitary Inspector's examination and was an Associate of the Royal Sanitary Institute.

During his time at the R.C.V.S. he served under the late Dr. Bullock, a training which he later said served him in good stead during his many years with the N.V.M.A. and later the B.V.A. One of his greatest assets was his astonishing memory; and after his retirement he returned regularly to Mansfield Street where he was able to help the permanent staff since he could recall details of nearly every major decision since he first was appointed. His knowledge of B.V.A. tradition and policy was profound and will be indeed irreplaceable; it made him a tower of strength to every incoming Officer. With Mr. Knight filing systems were hardly necessary, for he seemed to know where each paper was in the dustiest archives of the Association. When he was elected an Honorary Member of the Association at the 1960 Glasgow congress he said that he hoped that there might be opportunities for him to be of still further service in the future, and indeed there were many times when his advice and knowledge were sought.

In the last few months Mr. Knight was able to spend more time with his family, whom he dearly loved and with whom he spent his happiest hours. His children speak of the devotion and affection which he brought to their home, setting the 3 of them a never-to-be-forgotten inspiration—for 44 years a happily married man. His sudden death is all the more tragic in view of the very few months that he was able to enjoy his well-earned retirement, and the keen anticipation with which he and Mrs. Knight were looking forward to the spring and their many plans for a holiday and a "place in the country." Our deepest sympathies must be extended to his family at this time.

It is, perhaps, as a friend that his loss will be felt by the largest number. It was a privilege to have known him; in his personal charm and modesty he was an example to all.

The funeral took place at Golders Green crematorium last Saturday and among those present were Mr. Sydney Jennings (President of the B.V.A.), Mr. S. L. Hignett (Senior Vice-President), Mr. A. G. Beynon (Junior Vice-President), Mr. H. F. Hebeler (Honorary Treasurer), Miss J. O. Joshua (representing the President and Council R.C.V.S.), and Dr. E. Cotchin (representing Professor R. Lovell and Professor J. McCunn). Mr. John Anderson (General Secretary of the B.V.A.), Mr. P. Winterson (representing the staff R.C.V.S.), and Major C. W. Hume also attended. A large number of the B.V.A. headquarters' staff was present.

Mr. Knight leaves a widow and 2 sons and a daughter.

The Victoria Veterinary Benevolent Fund

A meeting of the Council of the Victoria Veterinary Benevolent Fund was held at College House, 29/31 Wright's Lane, London, W.8, on Wednesday, January 25th, 1961, when the following members were present:—

Mr. H. W. Dawes (President) in the Chair, Messrs. E. P. Barrett, E. Clark, J. T. R. Evans, Mrs. D. I. Glover, Messrs. J. M. Ingram, A. A. Lamont, Professors R. Lovell, J. McCunn, Mr. Norman P. Male, Mrs. E. I. Thomson, Miss V. Tillemont-Thomason, Capt. W. Watt, Mr. E. Wilkinson and Major W. H. Wortley.

Apologies for Absence

The Secretary reported the following apologies for absence:—

Capt. G. Atkinson, Professor G. F. Boddie, Mr. G. F. Brown, Major J. J. Dunlop, Mrs. H. I. Field, Messrs. R. C. U. Fisher, J. A. Flynn, Dr. R. E. Glover, Professor H. G. Lamont, Mr. D. H. L. Madden, Professors A. Messervy, L. P. Pugh, Major C. W. Townsend, Professor W. L. Weipers, and Capt. A. Whicher.

New Year's Honours List

The President, on behalf of the Council, warmly congratulated Mr. J. N. Ritchie, on the honour of Knighthood which had been bestowed upon him in the New Year's Honours List; and also expressed the members' great pleasure on his restoration to good health.

Welcome to New Members

The Chairman, on behalf of the Council, extended

a cordial welcome to the following new members:—

Mr. Norman P. Male, representing the Royal Counties Veterinary Association; Mr. J. T. R. Evans, representing the Kenya Veterinary Association; and Mrs. Erica I. Thomson, deputising for Mrs. H. I. Field, Victoria Veterinary Benevolent Fund Ladies' Guild.

Minutes

The minutes of the previous meeting held on October 27th, 1960, having been published in THE VETERINARY RECORD, were taken as read and signed as correct.

Correspondence

(a) Letter from Mr. W. G. R. Oates, Registrar, R.C.V.S., of January 10th, 1961, stating that the Royal College would be very happy for the Fund to use the College's new buildings as its London headquarters, and for the meetings of the Council and Committees also to be held at the said premises, as hitherto.

It was unanimously resolved that the Secretary be instructed to send to Mr. Oates the Council's grateful thanks for the Royal College's kind offer, which it had much pleasure in accepting.

(b) *Nominations to Council.* Letter dated October 6th, 1960, from the Hon. Secretary, Royal Counties Veterinary Association, nominating Mr. Norman P. Male, B.SC., M.R.C.V.S., D.V.S.M., as their representative in the place of Professor T. J. Bosworth, M.A., B.SC., M.R.C.V.S., D.V.S.M., resigned.

(c) *National Association of Almshouses.* Letter asking the Fund to renew its annual subscription.

It was resolved that the Fund's subscription to this Association be the same as last year, namely £5 5s. 0d.

Investments

The Treasurer reported that the sum of £477 17s. 7d. had accumulated in the Donations Account at the close of the financial year, and with the concurrence of the other members of the Executive Committee, it had been invested in the purchase of £522 3s. 3d. British Electricity 4½ per cent. Guar. Stock, 1967/69.

It was resolved that the Treasurer's action be approved.

Accountant's Report

The Secretary read the following report which was approved, a vote of thanks being accorded to the respective donors:—

	£	s.	d.			
Campbell, A. R.	1	1	0			
Elstead Horse Show	1	0	0			
Hare, W. C. D.		10	0			
In memory of the late Mr. N. S. King (15 contributors)	28	3	0			
Ladies Kennel Association ...	10	10	0			
Langstone Canine Society ...	1	1	0			
Matheson, R. C.	8	0	0			
Mid-West Veterinary Association Dinner/Dance	43	6	6			
Peck, E. F.	5	5	0			
Reidy, M. J.	10	0	0			
Richmond Dog Show	10	10	0			
Royal Veterinary College Field Station—staff and students ...	7	7	0			
Shepherd, W.		5	0			
Veterinary Drug Co. (York) ...	26	5	0			
Warren, A. L.	3	3	0			
From a Farmer in the Nottingham area	25	0	0	181	6	6
Collecting Boxes						
Anon	2	18	0			
Baxter & Forsyth	3	0	0			
Beckett, R. L.	2	15	0			
Brancker, Miss W. M.	1	0	0			
Brotherton & Palfree		13	6			
Bushman, G. N.	16	0	0			
Central Veterinary Society ...	6	9	3			
Chambers, Franklin & Chambers	3	3	0			
Davison & Taylor	1	7	0			
Edwards, J. B.		17	6			
Essex Veterinary Society	3	0	0			
Gould, G. N.	3	8	6			
Hewer, Spriggs & Wilson ...	2	10	0			
Holmes, J. R.	7	12	0			
Hopson, C. G.	2	2	0			
Howard, C. T.	4	0	0			
Irwin, T. H. R.	1	3	6			
Lake, D. A.		7	6			
Lamont, A. A.	1	15	0			
Marshall, W. S.	2	10	0			
Mid-West Veterinary Association	3	1	0			
Morton, Miss D. R.	4	3	6			
Morton, J. T.	3	12	6			
North Wales Division	2	19	3			
Oliver, D. F.	1	1	6			
Pasfield, J.	5	0	0			
Pollock, Miss S. M.	3	0	0			
Rorrison, J. M.	1	4	6			
Royal Counties Veterinary Association	9	6	0			
Russell, Miss E. E. B.	2	15	0			
Scottish Regional Gp., A.V.T. & R.W. (2)	4	13	0			
Shipley & Son	2	3	6			
Society for the Study of Animal Breeding	6	5	0			
South East Midlands Veterinary Association	6	5	6			
South Eastern Veterinary Association	9	7	0			
Southern Counties Veterinary Society	6	10	0			
Sussex Veterinary Society ...	5	5	0			
Sutton, Sutton, Thonger & Rogers	2	0	0			
Tweedale, O. L.		10	0			
Veterinary Investigation Officers Annual Conference	8	2	5			
West of Scotland Division ...	5	10	0			
Western Counties Veterinary Association	2	16	9			
White, J. B.	1	1	0			
Wilkinson, E.	3	6	0			
Woods & Dalby	5	0	0			
Wortley, W. H., & Partners ...	1	0	9			
Wright, James	1	1	0			
Yorkshire Veterinary Society ...	8	4	0			
				181	15	7
				£363	2	1

Subscriptions under Deed of Covenant

The Secretary also intimated that during the quarter, 4 new covenants had been received, and 23 members had renewed their covenants, all of which were to operate as from January 1st, 1961. Appropriate letters of thanks had been sent in each case.

Christmas Gifts

The Secretary reported:—

(a) That as a result of a special appeal in THE VETERINARY RECORD early in December, the sum of £180 12s. 6d. was received.

(b) That the Executive Committee, with the assistance of Mrs. D. I. Glover, had agreed on the following gifts, which were despatched to the beneficiaries on December 19th:—

10 @ £10	...	...	£100
16 @ £8	...	...	128
7 @ £7	...	...	49
4 @ £5	...	...	20
37			£297

It was resolved

That the action of the Executive Committee in sending out special gifts in December to 37 recipients of the Fund at a cost of £297, as detailed in the list submitted to the meeting, be, and the same is hereby, approved.

(c) That 2 members of the profession had asked for the name of a recipient of the Fund for the purpose of sending a Christmas parcel.

(d) That an anonymous parcel, posted at Cranleigh, Surrey, containing articles of clothing, etc. had been redirected to one of the Fund's cases with young children. The recipient's letter of thanks was read to the meeting.

Building Land near Christchurch

The Secretary reported that since submitting the Fund's offer of April 30th, 1960, to the Trustees of the Mary Elizabeth Dacombe Homes of Rest for the purchase of plots Nos. 5, 6, 7 and 8, the Fund had had correspondence both with the Trustees and the Charity Commissioners in regard thereto, and on July 28th, the Solicitor and the Secretary met Mr. B. W. Paluck, Charity Commissioners, by appointment, for the purpose of seeking the co-operation of the Commissioners in obtaining an early decision on the offer.

As a result of subsequent correspondence from the Commissioners, Miss M. R. Dacombe informed the Secretary of the V.V.B.F. on November 5th that the delay in these negotiations had been due to their architect's absence in the United States during the autumn, but that he had now returned and would be giving early attention to the question of road costs, etc.

Cases

No. 132. Wife of member. Aged 62. Husband an invalid. Three children, all married, and unable to help. The meeting, having considered a letter dated December 29th from this recipient, it was agreed that a member of Council's offer to look into this case and report be warmly accepted, and that the Executive Committee be empowered to take appropriate action thereon.

No. 170. Widow, aged 74. Suffers from arthritis. Living with married daughter. Receiving allowance from N.A.B. This case was reviewed and it was agreed to continue the grant of £1 p.w. for a further 12 months.

No. 245. Widow, aged 75. *It was resolved*:—
That notwithstanding the allowance which the N.A.B. has been making in this case since November 1st, 1960, the Fund's grant of £2 10s. 0d. p.w. be not disturbed for the next 12 months.

No. 265. Widow, aged 70. Semi-invalid. *It was resolved*: That notwithstanding the allowance which the N.A.B. has been making in this case since November 25th, 1960, the grant of £2 p.w. be not disturbed for a further 12 months.

No. 295. Widow, aged 46. Daughter, aged 10, at Caledonian Schools, Bushey. *It was resolved*:—
That the grant in this case of £2 p.w. be continued for a further year.

No. 304. M.R.C.V.S. Aged 62. In delicate health. Son, aged 34 and 2 daughters, 27 and 16. *It was resolved*:—
That notwithstanding the decision arrived at in this case at the previous meeting, the grant of £2 p.w. be continued until the end of March.

No. 326. Widow, aged 33. Three children between the ages of 9 to 2½ years. The Secretary reported that this recipient moved to Edinburgh on December 12th last. *It was resolved*: That the present grant of £5 p.w. be continued until the end of March when the recipient be asked to submit a further statement of her financial circumstances;
That the Executive Committee be empowered to deal with the question of the Fund contributing towards her removal expenses.

No. 331. Widow, aged 37. Five children between 12 to 3½ years. Having regard to the instructions given to the Secretary at the last meeting and to the reply to his letter from the Hon. Treasurer of the Irish Veterinary Association's Scrutinising Committee, the Executive Committee had agreed to the grant in this case being increased to £2 p.w. as from December 1st.
It was resolved: That the action of the Executive Committee be confirmed.

No. 339. Widow, aged 36. Two children, son, aged 3, and daughter (blind) aged 9. As this recipient is now holding a teaching appointment, *it was resolved*: That her grant be continued until the end of March when the case be reviewed again in the light of her financial circumstances, to be made available at the April meeting.

No. 341a. Daughter of late member. Aged 46. Father died on August 13th, 1960. Daughter helping towards Nursing Home expenses where her mother is bedridden. The Secretary reported the receipt of a letter from the daughter stating that her mother died on January 12th and expressing her appreciation and thanks for the financial assistance the Fund had given to her parents.

No. 342. Widow, aged 47. Two children, son, aged 15, and daughter, aged 11, both at school. Applicant holding part-time appointment. Consideration having been given to a letter from this recipient dated January 12th *it was resolved*: That in addition to her present grant, which shall be reviewed in 12 months' time, a special payment of £25 be made in this case.

No. 345. Widow, aged 75. The President reported that this case came before the Executive Committee early in January when it was decided to make an immediate special payment of £10 and a grant of £2 p.w. as from January 1st. The meeting confirmed the action of the Executive Committee and requested the Secretary to obtain further information, as indicated in the discussions on this case.

Date of Next Meeting

It was agreed that this matter be left in the hands of the Executive Officers.

Other Matters

(a) *Annual General Meeting.* After discussion, it was decided that the 1961 Annual General Meeting be held in London in the month of May, and that it be left to the President to arrange the place and time of such meeting.

(b) *Visitations to recipients of the Fund.* It was suggested by Capt. W. Watt, that at the next meeting, consideration should be given to the desirability of drafting a scheme for visits to be made to the Fund's recipients at least once a year by a Member of Council, or a nominee.

News and Comment

B.V.A. POULTRY REFRESHER COURSES

Applications for attendance at the courses to be held by the B.V.A. in conjunction with the Ministry of Agriculture will now be accepted up to Monday, April 17th. The programmes to be held at the various centres during May were outlined in THE VETERINARY RECORD of March 18th, and it is hoped that members will take advantage of this extension to apply to the General Secretary, B.V.A., 7 Mansfield Street, London, W.1, for further accommodation.

NEW B.V.A./R.S.P.C.A. AGREEMENT

Copies of the new agreement with the R.S.P.C.A., which came into force on April 1st, are now available to members of the B.V.A. on application to Headquarters.

LONDON ZOO RECEIVES A NEW GRANT

The Zoological Society of London has received a further grant of $95,000 from the Ford Foundation to supplement the grant of $550,000 announced in May, 1960. Both these grants have been made to support a programme of research in animal reproduction.

The original grant of $550,000 from the Ford Foundation was to endow a series of Research Fellowships and the appointments of Dr. Peter Jewell, Dr. Lorna Kellas and Mr. David Kirby to the first three Fellowships were announced in February of this year.

IN PARLIAMENT

Veterinary Surgeons in Tanganyika

Mr. de Freitas (April 11th) asked the Secretary of State for the Colonies whether he is aware that the terms and conditions of service offered to veterinary surgeons in Tanganyika are such as to attract into employment Continentally-trained veterinarians with qualifications not acceptable for registration by the Royal College of Veterinary Surgeons; and whether he will examine these terms and conditions with a view to their revision to deal with this problem.

Mr. H. Fraser: The Tanganyika Veterinary Board is empowered by local legislation to licence veterinary officers in Government Service as veterinary practitioners even though their qualifications are not recognised by the Royal College of Veterinary Surgeons.. By this means five veterinary surgeons with Continental qualifications have recently been recruited. I hope, however, that the new Tanganyika salaries will prove a stimulus to recruitment from here despite the high level of employment in this country.

Mr. de Freitas asked the Secretary of State for the Colonies whether he is aware that the terms and conditions of service offered to veterinary surgeons in Tanganyika are not such as to encourage experienced British-trained expatriates to remain in Tanganyika; and whether he will examine those terms and conditions with a view to their revision to deal with this problem.

Mr. H. Fraser: The terms of service of the Tanganyika Public Service, including veterinary surgeons in that Service, are being substantially improved following the recommendations of the East African Salaries Commission which reported in January. I hope that these improved terms of service will encourage British trained veterinary surgeons to remain.

UNIVERSITY NEWS

Edinburgh

FACULTY OF MEDICINE

ROYAL (DICK) SCHOOL OF VETERINARY STUDIES

The undermentioned candidates have passed the Part I Examination for the Diploma in Tropical Veterinary Medicine (D.T.V.M. Univ.Edin.):—

Branagan, Denis, M.R.C.V.S.; Dahab, Ahmed M., DIP.VET.SCI.(KHARTOUM); Down, Bryan C., M.R.C.V.S. (LONDON); Fraser, Charles E. O., B.V.SC., M.R.C.V.S. (LIVERPOOL); Kagoda, James H. DIP.VET.SCI. (MAKERERE); Lawrence, John A., B.SC., M.R.C.V.S.; Stoddard, Hannis L., Jr., B.SC., D.V.M.(TEXAS).

The undermentioned candidates have passed in the subject of Tropical Veterinary Parasitology of Part I Examination for the Diploma in Tropical Veterinary Medicine (D.T.V.M. Univ.Edin.):—

Ghoshal, Nani G., G.V.SC.(CALCUTTA); Macfarlane, Iain M., M.R.C.V.S.; Richards, Benjamin G., B.V.SC. (PUNJAB), M.R.C.V.S.

London

FACULTY OF MEDICINE

B.VET.MED.

VETERINARY CLINICAL EXAMINATION—PART I

(FOR INTERNAL STUDENTS)

March, 1961

Pass List

ROYAL VETERINARY COLLEGE

Bailey, Paul Patrick; Baldry, Alan Frederick; Baron, James Hartley; Carter, James Gordon; Crooks, Arthur; Grandage, John; Gray, John David Learmonth; Green, David Russell; Hatherill, Charles Wythan Baxter; Hawken, Michael Lynn; Hazell, John Lancaster; Hilbery, Anthony David Rowland; Houldgreaves, Ian David; Kirk, Elizabeth Helen; Lewis, Christopher James; Martin, Roger Courtney; Mathewson, Michael John; Peters, Frederick William; Peters, Gillian; Pooley, Bryan Robert; Saunders, John George; Simmons, John Rider; Sismey, Ronald; Smith, John Richard; Smith, Simon Eric Gilbert; Sopp, Robin David; Stevens, Roger Christopher Kirk; Symonds, Herbert William; Tarttelin, Michael Frank; Thompson, Brian John; Towlerton, Richard George; Tyzack, Jennifer Mary; Whittingham, David Gordon.

Glasgow

DEPARTMENT OF VETERINARY PATHOLOGY

DEGREE OF B.V.M.S.

THIRD PROFESSIONAL EXAMINATION, PART II

The following candidates have satisfied the examiners:—

Cable, Christine A.; Cawley, Graham D.; Clark, John C.; Coutts, George S.; Dawe, Patrick S.; Dudlyke, Richard G.;

Garland, Anthony J. M.; Gray, John B.; Guthrie, Ian L.; Harries, William N.; Hill, Anthony T. M.; Howard, Bryan R.; Jarrett, James O.; Kyle, Philip C.; Leadbitter, William T.; Longstreeth, John R.; McCrudden, Fiona F. A.; MacDonald, Samuel C.; McEwan, Andrew D.; McGaughey, Marguerite; Mackey, Lindsay J.; Murray, Maxwell; Oyekola, Lasisi L.; Reid, James F. S.; Riley, Frederick B.; Ritchie, John S. D.; Rushton, Richard B.; Scholes, Rowan W.; Shepherd, Matthew T.; Sowter, Robert M.; Thomson, Peter B.; Uzoukwu, Mba; Weir, Finlay; White, Sheila S.; Whur, Paul; Wilson, Robert J. W.; Wright, Norman G.; Wright, William B.

DEGREE OF B.V.M.S.
SECOND PROFESSIONAL EXAMINATION
MARCH, 1961

The following Passes are announced in the subjects of Veterinary Histology, Embryology and Anatomy, and Physiology and Biochemistry:—

Freeland, Guy G.; Gold, Margaret A.; Kerr, Peter; Lucas, David J.; Macaulay, Brian J. B.; Sayer, Paul D.; Young, William B.

The following Passes are announced in the subjects of Veterinary Physiology and Biochemistry:—

Erhiaganoma, Erhire J.; Newman, Michael J. N.

R.C.V.S. OBITUARY

We record with regret the deaths of the following members of the profession:—

LOW, Leonard Allfrey, Scaldwell, Northants. (Supplementary Veterinary Register, number 76). Registered December 23rd, 1949. Died in the Hering General Hospital, Northants., at the end of July, 1960, aged 76.

STORIE, James Clapperton, 3 York Road, Beverley, E. Yorks. Captain, late R.A.V.C. (T.F.). Graduated at the Royal (Dick) School of Veterinary Studies, May 20th, 1908. Died April 3rd, 1961.

PERSONAL

Engagements

RICHARDSON—CRAIG.—The engagement is announced between Martin, elder son of Mr. and Mrs. D. Richardson, of Melksham, Wilts., and Mollie, daughter of Canon C. H. B. and Mrs. Craig, The Rectory, Ballymena, N. Ireland.

ROSS—ROBB.—The engagement is announced between David B. Ross, M.A., VET.M.B., M.R.C.V.S., of the Animal Health Trust, Stock, Essex, and Elaine (Bunty) Robb, of St. Ives, Hunts.

Births

GALE.—On April 9th, 1961, to Diana, wife of V. G. Gale, B.VET.MED., M.R.C.V.S., of "Steep," Oakridge Lane, Sidcot, Winscombe, Somerset, a daughter, Nicola; a sister for Philip.

JUBY.—On April 1st, 1961, to Sally (*née* Mayes), wife of David Juby, B.V.SC., M.R.C.V.S., at Windyridge, Horrabridge, Yelverton, Devon, a son, Simon Timothy, brother for Martine.

COMING EVENTS

April

19th (Wed.). WARWICKSHIRE VETERINARY CLUB. Meeting in the Regent Hotel, Leamington Spa, 7.30 p.m.

20th (Thurs.). NORTH OF ENGLAND VETERINARY MEDICAL ASSOCIATION. Joint Meeting with the North of England Branch of the B.M.A. in the Royal Victoria Infirmary Lecture Theatre, Newcastle upon Tyne, 8.30 p.m.

20th to 23rd (Thurs. to Sun.). B.S.A.V.A. Congress at the Kensington Palace Hotel, de Vere Gardens, London, W.8.

21st (Fri.). NORTH OF IRELAND VETERINARY ASSOCIATION. Annual Dinner at the Grand Central Hotel, Belfast, 7 p.m.

24th (Mon.). EAST YORKSHIRE CLINICAL CLUB. Meeting at the Talbot Hotel, Malton, 8 p.m.

26th (Wed.). SOUTHERN COUNTIES VETERINARY SOCIETY. Meeting at the Red Lion Hotel, Salisbury, 7.30 p.m.

28th (Fri.). LIVERPOOL UNIVERSITY VETERINARY SOCIETY. First Annual Dinner at Reece's Restaurant, 7.30 p.m. for 8 p.m.

YORKSHIRE VETERINARY SOCIETY. Meeting at the Royal Station Hotel, York, 2.30 p.m.

29th (Sat.). ASSOCIATION OF STATE VETERINARY OFFICERS. Annual General Meeting in Kent Room, Caxton Hall, London, S.W.1, 4 p.m. Dinner at the Criterion, Piccadilly, 6.30 p.m.

May

3rd (Wed.). SOUTH EASTERN VETERINARY ASSOCIATION. Meeting at Wye College, Wye, Kent, 2.30 p.m.

25th (Thurs.). MIDLAND COUNTIES VETERINARY ASSOCIATION. Annual Dance at the Penn Hall Hotel, Sutton Coldfield.

30th (Tues.). SOCIETY FOR THE STUDY OF ANIMAL BREEDING. Meeting at the Royal Society of Medicine, 1 Wimpole Street, London, W.1, 11.30 a.m.

September

3rd to 9th (Sun. to Sat.). 79th Annual Congress of the British Veterinary Association at Oxford.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Lancs. Bells Farm, Pilling, Preston (Apr. 4).
Norfolk. Manor Farm, Bintree, Dereham (Apr. 4).
Notts. Manor Farm, Ompton, Newark (Apr. 4).

Fowl Pest

Berks. 51a, Barkham Road, Wokingham (Apr. 8).
Essex. 268, Lodge Lane, Collier Row, Romford (Apr. 10).
Glos. Pillows Green, Corse, Staunton (Apr. 4).
Hunts. 139, Peterborough Road, Farcet (Apr. 5).
Lincs. Reedsbeck, Sandy Lane, Woodhall Spa (Apr. 10).
Norfolk. Framlingham Chase, Framlingham, Norwich (Apr. 5); Kimberley Hall, Kimberley, Wymondham (Apr. 7); Boundary Farm, Ash Lane, Carleton Rode, Norwich; No. 1 site, Stonerd, Hockering, Dereham (Apr. 9).
Northants. 58, North Street, Stanground, Peterborough; 60, North Street, Stanground, Peterborough (Apr. 6); 30, North Street, Stanground, Peterborough (Apr. 8).
Suffolk. Flint Hall, Brandon (Apr. 8).

Surrey. Corrie, Chertsey Road, Chobham, Woking; Littledene, Beta Road, Chobham, Woking (Apr. 5); Besholme, Gracious Pond, Chobham, Woking (Apr. 6); Fowlers Well, Chobham, Woking (Apr. 7).

Warwicks. Shakespeare Farm, Studley (Apr. 6).

Worcs. Longacre, Evendine Lane, Colwall, Malvern (Apr. 4); Lower House, Evendine, Colwall, Malvern (Apr. 5); Broadlands, Green Lane, Malvern Wells (Apr. 6); 16, Evendine Corner, Colwall, Malvern (Apr. 7); Derrycroft, Colwall, Malvern (Apr. 8); Ryall Lawn, Upton-on-Severn (Apr. 9).

Swine Fever

Bucks. Thanestead Farm, Loudwater, High Wycombe (Apr. 10).

Cambs. Peacock Lane, Cottenham Road, Histon (Apr. 6).

Ches. The Fields Farm, Lower Peover, Knutsford; Leighton Lodge Farm, The Runnell, Neston, Wirral (Apr. 7).

Devon. Little Moor Farm, Moor Lane, Sowton, Exeter (Apr. 4).

Durham. Smallholding, Gloucester Road, Crookhall, Delves Lane, Consett; Shellham Farm, Front Street, Kirk Merrington, Spennymore; Beechwood Poultry Farm, Fairfield, Stockton-on-Tees (Apr. 4); Piggery, No. 1 Poultry Centre, Back Cemetery Road, Wheatley Hill (Apr. 5); Lovesome Hill Farm, Brafferton, Darlington; Poor Close Farm, Blackbanks, Darlington; Mordon South Side Farm, Sedgefield, Stockton-on-Tees (Apr. 7); Downland Farm, Stillington, Stockton-on-Tees; 24 The Green, Billingham; Heather Piggeries, Windy Nook, Gateshead, 10 (Apr. 10).

Essex. Piggeries rear of Brent House, Harlow Common, Harlow (Apr. 6).

Lancs. Ladyhouse Piggeries, Milnrow, Rochdale (Apr. 4); Sandy Lane Farm, Sandy Lane, Preesall, Fleetwood (Apr. 6); Burnt House Farm, Blacko, Nelson (Apr. 7).

Norfolk. Stanway Farm, Saham Toney, Thetford (Apr. 4).

Notts. Manor Farm, Bole, Retford (Apr. 4).

Surrey. Little Farleigh Green, Farleigh, Warlingham (Apr. 4).

Yorks. Gas House Field, Seamer Road, Scarborough; Rookery Farm, Winterburn, Skipton (Apr. 4); 1, Hambleton View, Hornby, Great Smeaton, Northallerton; West End, Beeford, Driffield; Markenfield Hall Farm, Ripon (Apr. 6); Palmerston House, Scalby, Gilberdyke, Brough (Apr. 7); Frodingham Hall, South Frodingham, Halsham, Hull; Elm Tree Farm, St. Hilda Street, Sherburn, Malton (Apr. 10).

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

GENERAL

Mr. F. Knight

Sir,—Very shortly after Fred Knight took over his office with the N.V.M.A. I wrote to him for advice regarding accommodation for the coming annual congress, I believe at Dublin. A few days later I received a reply that a room had been duly booked for me and he would be looking out at Crewe station where I was to board the train. This was my first meeting with him and although it is 35 years ago it remains typical of the service given not only to me but to all who asked this kindly, unassuming, conscientious man.

When he called with his family to see me a few months ago on the eve of his retirement, little did I think it would be our last meeting. Personally, I feel I have lost a true friend and I should like to extend my sympathy to his wife and family.

Yours faithfully,

Acle, O. V. GUNNING.
Nr. Norwich.
April 10th, 1961.

The Production of Specific Pathogen-free Pigs

Sir,—We were interested to read the article in THE VETERINARY RECORD of March 25th by Messrs. A. O. Betts and D. Luke concerning the production of "specific pathogen-free" pigs in the U.S.A.

We note that in their introduction they state: "In this country pigs taken by hysterectomy and their progeny have, to date, been used only for research purposes." In fact we in this practice have been performing routine hysterectomy on sows from infected herds so that the piglets may be introduced into a well known virus pneumonia-free establishment for breeding purposes.

The piglets produced in this way are fostered by VPP-free sows and have reared well.

In collaboration with the highly efficient management of this herd we have evolved a simple technique which can be carried out on the farm without undue difficulty.

It is hoped to prepare a short clinical article describing the methods used as we think it may well help others to adopt a comparatively simple procedure.

Yours faithfully,

Llanover Lodge, K. G. MORGAN.
Chepstow, Mon. D. A. PARKES.
April 5th, 1961. D. H. W. BROWN.

The Future of Animal Husbandry in Overseas Territories

Sir,—The response to Professor Miller's provocative article in THE RECORD of January 7th, 1961, in the copies which have so far reached me has been most disappointing. One hopes that this is no index of the interest in the subject by the profession in the U.K. Although those most able to appreciate the tragedy involved are overseas it must be realised by any politically conscious citizen that the matter is one of vital concern to all.

Mr. Matson and Mr. Yeoman have both mentioned the "run down" of veterinary services which is proceeding at an accelerating pace in all former colonies. This process has probably affected the British Colonies least of all but nevertheless the process which those of us who remain here see, is an alarming one. Africa north of the Zambesi is rapidly being leached of her trained and experienced officers. The reasons for their departure are without the subject of this letter, but the result will be to leave the bulk of Africa without trained or experienced professional officers. It will be very many years before this gap can be filled by suitably qualified local staff as supplied from existing teaching establishments.

The facilities for the training of such staff do not exist in the world to-day. Apart from Pretoria University (Onderstepoort) which is ideologically unacceptable to most Africans, there is no school of tropical veterinary medicine of U.K. degree standard in the world.

The need for a training centre for veterinary surgeons with special emphasis to tropical veterinary problems thus seems to be a clear one and here Britain with its traditional interest in African affairs should take the lead. No one can doubt that money devoted to the training of veterinarians in this way would be better spent than it is on many of the schemes which at present attract development and welfare or other grants—money so often spent on projects which at best can only have a temporary impact on the changing face of Africa. The training required must be more closely adapted to the needs of the countries concerned—greater emphasis being given to livestock husbandry and production and to diseases of the tropics, at the expense of clinical medicine and surgery.

One would need to be clairvoyant to assess the possible permanence of a teaching school in Africa itself, attractive as such an idea appears superficially. Values are changing rapidly and few who know Africa at first hand to-day could agree that a school (or at that matter a research organisation) here has any reasonable long term expectation of maintaining standards. For this and for other good reasons such training should be offered in the U.K.

The future of the present D.T.V.M. course comes to mind and one feels that an expanded degree course of the scope outlined above might well supplant it at the present time. Possibly one of our teaching schools might consider granting a degree in tropical veterinary medicine instead of the present more "temperately adapted" qualification. The staff devoted to problems of the tropics might at the same time go some way towards solving the problems of future tropical veterinary research foreseen by Messrs. Yeoman and Matson.

I would strongly support Mr. Yeoman's suggestion that the matter should be urgently reviewed by the Overseas Committee of the B.V.A. and an approach with thought along new lines, untrammelled by the now odious "Colonial" approach, be sought.

Yours faithfully,
R. M. ARNOLD.
Chief Veterinary Research Officer.
Ministry of Agriculture and Co-operative Development, Division of Veterinary Services,
P.O. Box 9152,
Dar es Salaam, T.T.
April 8th, 1961.

"Town Vet"

Sir,—I am sorry that Mr. Steele was "shocked" by the T.V. programme "Town Vet." In my opinion it was a fairly accurate characterisation of some of our lady colleagues. In any case one really cannot expect the B.B.C. to provide us with a free plug for the profession, all seen through rose-tinted spectacles.

As one who has given up expecting the profession to do anything about public relations I am grateful for the small crumbs of mercy we are offered. People in glass houses shouldn't throw stones, nor should they look gift horses in the mouth.

Yours faithfully,
DAVID NUNNELEY.

32 Greenfield Avenue,
Northampton.
April 9th, 1961.

I am sorry Mr. Nunneley has given up expecting the profession to do anything about Public Relations as, certainly since the appointment of our General Secretary, relations with the press, television and the B.B.C. have steadily improved. Getting the co-operation of all these media can be almost as difficult as getting a gift horse into a glass house, and it should be remembered that if our advice is not sought we are not in a position to know what is happening. However, if Mr. Nunneley could spare the time to attend the B.S.A.V.A. Congress there is a good chance that he would be able to meet the producer of the programme and discuss it with him. *Vice-Chairman, Parliamentary and Public Relations Committee of the B.V.A.*

"Radiography for the Veterinary Surgeon"

Sir,—Your reviewer of "Radiography for the Veterinary Surgeon" (p. 346 of April 8th issue) made the erroneous assertion that veterinary surgeons have been hampered by the absence of any guide to radiographic techniques. Surely he could hardly have failed to hear of my own book "Index of Diagnosis, Clinical and Radiological" which has been in extensive circulation for 8 years.

No less than 80 pages of this book were devoted to all aspects of radiography, including a description of the apparatus, contrast radiography and an exposure table, etc., etc.

So far as I am aware, this book was the first and only one to give radiographic information to the veterinary surgeon. It was followed 2 or 3 years later by an exclusive work by Gerry Schnelle of the U.S.A.

In any case, your reviewer's remarks about Gould's and Wright's books hardly resound to their credit, so that had my own book never appeared, the veterinary surgeon might still have been hampered by lack of information.

Yours faithfully,
HAMILTON KIRK.

Loddon Drive,
Wargrave,
Berks.
April 8th, 1961.

Enteric Diseases and Utilisation of Vitamin A

Sir,—Through a temporary absence overseas, Mr. Barton Mann's comments (*Vet. Rec.* **73.** 151) on my letter have only just been brought to my attention.

The work of Harvey *et al.* (1955) has clearly demonstrated that healthy chicks can utilise vitamin A, administered orally, as early as the fifth day after hatching (probably even earlier), and day-old chicks can convert carotene to vitamin A. Several other groups of investigators had earlier established that chicks can absorb dietary carotene and can convert it to vitamin A by the end of the first week after hatching (Bolin *et al.*, 1943; Temperton & Dudley, 1945); Laughland and Phillips (1955) have also confirmed these findings.

Chicks, 2 to 3 weeks of age, are routinely used in absorption tests for different vitamin A forms in many laboratories.

The negative results obtained by Mr. Barton Mann in 1946 may be explained by the fact that animals in an advanced stage of vitamin A deficiency cannot utilise vitamin A or beta carotene, or, at best, only very inefficiently. This has been demonstrated by the work of Erwin, Elam and Dyer (1957) and of Diven and Erwin (1958) on cattle and sheep, and of Gartner and Burton (1957) on chicks. This last group of workers clearly demonstrated that if a vitamin A deficiency exists in the egg or during early life then even the most intensive supplementation with the vitamin subsequently will fail to overcome all the after-effects of the deficiency.

T. Moore in his standard work on vitamin A (Elsevier Publishing Company, 1957) describes on page 469 a typical experiment on the level of vitamin A in the blood of newborn calves, only one of which was allowed colostrum. Since vitamin A is present in milk as the ester of fatty acids there can be no doubt that vitamin A acetate or palmitate are effectively absorbed by calves during their first days of life.

Yours faithfully,
G. H. CLEMENT.

6B Hyde Park Mansions,
London, N.W.1.
April 10th, 1961.

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SCIENTIFIC

The Influence of Diet on the Presence of an Iron-containing Pigment in the Keratinised Layer of the Epithelium of the Rumen, Reticulum and Omasum of Cattle

Sir,—Sinclair and Kunkel (1959) recorded the finding of a brownish-black keratinised layer of the rumen epithelium in feed-lot lambs and that the intensity of the colour appeared to be related directly to the rate of weight gain. Brownlee and Elliot (1960) recorded wide variation in the colour of the omasal epithelium of cattle from straw-coloured to light slate-coloured. Preliminary tests for iron, using potassium-ferrocyanide plus hydrochloric acid, carried out on darkened epithelium from the rumen, the reticulum and the omasum of cattle gave positive Prussian-blue reactions, the intensity of colour of which varied directly with the intensity of darkening of the epithelium.

Material from the epithelium of one or more of the first three stomachs of the following animals was subjected to the ferrocyanide test; many of the animals included in the groups listed were examined at an abattoir and, as no history was obtained in such cases, the group ages can be regarded only as approximate:—

	Positive	*Negative*
105 calves a few days old ...	4	101
105 cattle about 10 days to about 1 year	58	47
87 cattle about 1 year to adult	58	29

Material from the mucous membrane of the abomasum of 64 cattle, in 34 of which the epithelium of the first three stomachs did show positive ferrocyanide reactions, gave a negative reaction in all cases. There is a sharp dividing line between a pigmented omasum and the unpigmented abomasum adjoining; similarly there is a sharp dividing line between a pigmented rumen and the unpigmented oesophagus adjoining.

Confirming Sinclair and Kunkel's finding, our sections of the first three stomachs showed the pigment to be confined to the keratinised layer either while still attached or after shedding. In these sections the pigment stained blue with potassium ferrocyanide plus hydrochloric acid.

At this station 12 calves were reared to 2 months of age on a milk and hay diet; 12 were reared to a similar age on an "early-weaned" diet entailing the use of a proprietary calf concentrate available *ad libitum* from birth onwards and of a restricted ration of milk up to 5 weeks of age only. Hay *ad libitum* was allowed to both groups.

At autopsy the former 12 all showed a straw-coloured epithelium in the first three stomachs, which epithelium gave a negative test for iron, whereas the latter 12 all showed a darkened epithelium which gave a positive reaction. The *p*H of the rumen contents of 3 of the 12 from the former group was 7.0, 6.8 and 7.0 respectively and for 3 of the 12 from the latter group 5.5, 5.4, 5.3. The *p*H of the rumen contents of the other calves was not tested.

The ash from a sample of darkened epithelium gave positive reactions to tests for ferric ions.

Further work is in progress.

We are indebted to Dr. B. F. Sansom for showing the presence of iron in ashed material and Miss K. Bailey and Mr. D. Jessett for technical assistance. Mr. A. Meade, M.B.E., kindly granted facilities for the collection of material at Reading Abattoir.

Yours faithfully,
A. BROWNLEE.
J. ELLIOT.

Agricultural Research Council,
Field Station,
Compton,
Berks.
April 6th, 1961.

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